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World of Electronics

6 **What's New** *New Philips 100Hz 'Flicker Free' 82cm widescreen TV*
10 **Kenwood's KRF-V8881D AV Receiver** *AC-3 and DTS decoding!*
14 **What to Look for in a DVD Player** *What the latest models offer...*
20 **The Philips DVD 725** *Low in cost, and it plays CD-R discs as a bonus*
22 **Sony's DVP-S525D** *Features built-in AC-3/MPEG2 decoding, more*
26 **Entering the Era of Virtual Acoustic Spaces - 1** *How it's done*
34 **Open Fist** *The media and the ESAA study*
36 **Canon's FC220 Personal Copier** *How good are these baby copiers?*
48 **Vintage Radio** *Three Healing radios using vibrator supplies*
70 **Moffat's Madhouse** *Tom's new Digital Recorder (MP3 music)*

Projects and Technical

41 **Serviceman** *When the right parts aren't available, use your head!*
54 **Circuit & Design Ideas** *Single-channel remote control; simplified I^2C*
56 **PC-Driven Video Text Overlay Module** *Hooks up via the printer port*
60 **Low Cost Video Clock Message Generator** *Great for surveillance!*
64 **Digital Timer Enhancement** *Put that LCD clock/timer to work...*
66 **$10 Wonders** *26 — A Tuneful Timer*
68 **Computer Clinic** *UK or US keyboard? More pesky password problems*

Columns and Comments

4 **Letters to the Editor** *CFLs and IR remotes; power lines & health*
5 **Editorial Viewpoint** *Not all DVD players are the same; some are better!*
38 **Forum** *More on DVDs and region coding, complaint re TV station logos*
51 **Information Centre** *Projects, measuring fuel flow, CGA video & more...*

Departments

72 **EA Marketplace**
74 **EA History, Crossword**
90 **New Books**
91 **EA Subscriptions Offer**
97 **Webwatch**
98 **Directory of Suppliers**
98 **Advertisers Index**
— **Notes & Errata**

On the cover

Not far behind a big-screen TV is the DVD player, when you're setting up a home theatre. Our feature (p.14) on DVD players explains what's available in the latest models, and what to look for when you're choosing the right player for you. (Photo by Michael Pugh)

Creating a better sound

26

Australia's engineers are at the leading edge of 'virtual acoustics', as John Matheson explains...

Pen-sized 5MHz scope

84

How much smaller can they make them? Not much smaller than the new osziFOX, hopefully!

Great for surveillance

60

Need to provide a video recording with 'time and date' info? David Jones' neat little project will do it...

Professional Electronics

76 **News Highlights** *CSIRO's 'nanotube' breakthrough for flat screens*
80 **Solid State Update** *CCD video signal processor chip for digital cameras*
82 **Tek's TDS3054 'DPO' oscilloscope** *Colour traces, 5GS/s sampling*
84 **The osziFOX pen-sized scope** *5MHz bandwidth, only marker-pen size!*
86 **New Products** *Compact insulation tester; regulated bench supplies*
92 **Silicon Valley Newsletter** *Intel moving to 12" wafer production*
94 **Computer News & New Products** *Ultra fast SCSI cards for RAID*

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Letters to the Editor

HP scope winner

What a pleasant surprise! I wish to acknowledge safe arrival of the 'all singing — all dancing' Hewlett Packard 'Infinium' 500MHz Digital Oscilloscope.

At the time I renewed my sub, I was aware of the prize being offered but I thought it applied only to new recruits. I didn't give it another thought until your office phoned with the good news.

I wish to sincerely thank EA for its generosity, offering such a valuable and sophisticated prize; and to the makers, I'm certain that in every way, the Infinium will live up to the name — which is synonymous for innovation and precision. I am eagerly anticipating some exciting days ahead exploring its many features.

Trevor Starritt, Tatura Vic.

Power lines & health

I'm writing in response to an article in *EA* (1997) regarding power lines and their affect on people living in the vicinity of these distribution cables. I was disappointed to learn that the only parameter that is used to judge the affects on humans is the Electromagnetic Field. The authorities quote magnetic flux units, and point out that the magnetic radiation from a hair dyer is many times stronger than one would receive from the outside power lines. Therefore they say, the power lines are safe.

Well, of course this is true, and there is no conclusive evidence that 50Hz alternating current, e.g., 250 to 440 volts at almost any flux unit, has any affect on the physiology of the human body. However, there is one important item that seems to have been deliberately left out of the argument: *electromagnetic radiation*. This form of energy radiates at right angles to the Electromagnetic Field around the conductor.

This radiation will occur if the following two conditions are met: (a) That the electrical conductor be subjected to very high voltage amplitudes of AC waveform, e.g., 300-500kV transmission lines. Under these conditions photons will be radiated in great quantities; (b) That the conductor be subjected to high frequency oscillations, e.g., 1MHz. Voltages can be as low as 0.01uV, and photons will be radiated.

Electromagnetic radiation is a potential danger to human health. Electromagnetic radiation travels a considerable distance from the high voltage transmission lines. Not only is this radiation modulated at 50Hz, but because of the difficulty in stabilizing the three phases, very low frequencies can also be present. It has been demonstrated that even at very small levels of very low frequency vibrations, the affects on humans can be quite serious and often can change human behaviour (depression, irritability etc).

I feel that the electrical engineers who are responsible for positioning these VHV transmission lines are either ignorant of the 'secondary emissions' from these cables and the consequences of them, or they are deliberately routing them for economic reasons — which results, in some cases, in positioning them close to schools and buildings where people sit for long periods of time.

Brian A. Sallur, St James WA.

BWD manuals source

Further to the letter published in your June issue, I wish to advise that service manuals for BWD instruments (photocopies only) are available (and have been for some years) from McVan Instruments, of 58 Geddes Street, Mulgrave Vic 3170.

Good luck!

Graeme Dennes (via e-mail)

Note of thanks

Just a quick note to say 'thank you' for the articles in *EA*. Although I haven't been in the electronics industry for a while, it was most refreshing to go through the past 30 issues or so (in the space of two weeks) and catch up on 'where it's all at' today.

A friend of mine kindly brought over his *EA* copies when my sanity started heading me towards the padded room (bedridden, with both arms in cast, broken pelvis, several muscular contractions and a few knocked ribs thrown in for good measure — there are only so many times one can contemplate his navel).

Reading the magazines from the latest issue back provided an added challenge, as many comments and forum articles had to be memorised and then chronologically reshuffled once the

original article was located (though the EM or 'Electronic Health Gadgets' issues nearly caused a stack-overflow).

Seriously, it has been a pleasure to read, to understand and to agree with so many of the articles.

Thank you, and keep the writing going; I'll be on your regular list again.

Peter Wolf (by e-mail)

CFLs and IR remotes

Just a quick note to confirm your suspicions about the new compact fluorescent lamps and the IR remote controller problem mentioned in the Serviceman column for June.

I have an Akai stereo system, and some months ago I noticed that the remote control would not work if I was using a compact fluorescent lamp about 10 metres away. I also fixed the problem by changing it for an incandescent bulb. So much for efficiency!

Graham Hunt, Mt Martha Vic.

Help wanted

I have a BWD model 845 oscilloscope that until recently has given sterling service. Now it has a fault that I am unable to track down; I was hoping someone could help out with a circuit diagram or service manual. I will pay for any photocopying or postage costs involved.

It appears to have a fault in the power supply, as there is no vertical deflection, and the intensity control doesn't work either. The +15 and -15 volt rails seem to be very unstable also, but as the power supply design is quite unusual, possibly due to the ability to use the scope from a DC supply from 20 - 30V, as well as normal 240 volts AC, I have been unable to track down the faults.

I have circuits for many older Australian built radios from both 1938 and 1949 in two editions of the *Australian Official Radio Service Manual*, that I can offer to assist fellow readers.

Raff. Lerro

21 Theodore Place, Ashmore 4214 ❖

Letters published in this column express the opinions of the correspondents concerned, and do not necessarily reflect the opinions or policies of the staff or publisher of Electronics Australia. We welcome contributions to this column, but reserve the right to edit letters which are very long or potentially defamatory.

Editorial Viewpoint

LAST MONTH, WE tried to give you a good basic understanding of what's currently available in terms of large-screen video display technology. Now that so many people seem to be keen about setting up a 'home theatre', we thought it was important to provide this help — especially as the 'big picture' display you use is likely to be the most costly part of your home theatre setup. We hope you found that feature worthwhile.

This month, though, we're changing the focus onto another key component in a modern home theatre. In fact it's really the prime cause of the resurgence of interest in home theatre, because of the higher quality video and audio it can provide: the DVD player.

Not all DVD players are the same: some are even better!

What's made it necessary for us to give you a new feature on DVD players is that the developments in this technology are now taking place at a surprisingly fast rate. You may not have noticed, but there's a new generation of DVD players now coming onto the market with features and performance significantly improved over the original models — and also the remaining stocks of fairly recent models, in some cases...

In short, this really is a very appropriate time to give you an update on what's actually available in the latest DVD players, which features are likely to be of most value to *you*, and therefore what to look for when you're facing a row of different models on the shelves of your local retailer. You'll find this feature starting on page 14. It even includes a comparison chart, to summarise the differences between most of the models currently on offer.

To accompany the feature, there are also hands-on reviews of two of the models released in the last couple of months: the Philips DVD-725 and the Sony DVP-S525P.

Of course there's plenty of other reading in the issue too, including the first of two very interesting articles on 'virtual acoustics' — the way electronics and digital signal processing are being used to achieve dramatic improvements in the acoustic performance of performance venues. Australian engineers are playing a leading role in this area, as John Matheson explains in his article starting on page 26.

Things are changing, but not dramatically...

By the way, this is actually the last editoral viewpoint you'll be reading from me, because after a hectic 12 years back in *EA*'s editorial 'hot seat', I'm moving aside to make room for my successor: Graham Cattley, who takes over as Editor with the September issue. I'm confident that together with Technical Editor Rob Evans and Production Editor Vitek Budzynski, Graham will continue to provide you with the same interesting and informative magazine — quite possibly even better.

What about me? Well, I do hope to keep closely involved in the magazine for the foreseeable future, as a Contributing Editor. So you should still be reading feature articles and reviews from me, for quite a while yet. I also hope to get back to designing a few construction projects again, because I really enjoy that too.

No sad goodbyes, then. But please stay tuned, to welcome Graham as the latest occupant of our 77-year-old hot seat!

Jim Rowe

WHAT'S new

in the ever-changing world of electronics

New LCD projectors from Panasonic

Panasonic has released two new LCD projectors designed for bright, clear presentations: the PT-L797E boardroom system, and the ultra-portable PT-L557E.

The PT-L797E multimedia projector is a high-end boardroom system, which uses two lamps to provide 1600 ANSI lumens of output — making it one of the brightest projectors in its class. In addition, two of these projectors can be stacked together, for even brighter images of 3200 ANSI lumens — suitable for use in large venues.

The PT-L797E also has true XGA resolution (1024 x 786 pixels) to project detailed computer images and graphics from high-end computers or engineering workstations. It also has a horizontal resolution of 760 TV lines.

The PT-L5576E is designed as an ultra-portable system, compatible with popular third-party PC cards (such as SanDisk) so the projector does not have to be connected to a computer during presentations. This is convenient for trade shows, or advertising, sales or promotional staff who must make presentations in a number of different locations.

The PT-L557E has a 200W lamp, with a brightness level of 1500 ANSI lumens, and achieves a centre-to-corner uniformity ratio of 95%-ensuring excellent screen images in all room lighting conditions. It supports true SVGA resolution at a full 800 x 600 pixels, but measures 263 x 124 x 336mm (WxHxD), and weighs only 6.2kg.

The PT-L797E is priced at around $20,995 RRP, while the PT-L557E is around $13,999 RRP. For more information contact Panasonic Customer Care on 132 600.

Speakerphone has Caller ID

Dick Smith Electronics has launched a new telephone that features a hands-free speakerphone and Caller ID display. The LCD screen displays the caller's number, and if the number is already programmed into the phone, will also display the caller's name. Up to 13 numbers can be programmed into the phone (three one-touch and 10 indirect).

The phone will store the numbers of the previous 99 calls in memory, so if a call is missed the number is displayed and the call may be returned. The LCD screen displays up to 16 digits and also displays the date, time, length of call and number of calls.

The new DSE-brand phone also has mute, redial, recall, flash and pause buttons, plus adjustable ringer tone and volume. It can be easily mounted on a wall if required and is call waiting compatible.

The DSE Speakerphone with Caller ID is available from Dick Smith Electronics stores Australia-wide and Dick Smith Electronics Powerhouse stores at Penrith, Bankstown, Moore Park in NSW and Carnegie in VIC for an RRP of $98, or via mail order by calling Dick Smith Electronics Direct Link on 1300 366 644.

Entry-level DVD player from Panasonic

Panasonic's new DVD-A160 entry-level digital video disc) player offers features designed for great reproduction of movie sound, including Advanced Virtual Surround Sound, Dialogue Enhancer, and Dolby Digital output. Other features include Hi-Speed Motion Scan, Quick Start and Chapter Preview. The DVD-A160 has an RRP of $1099.

For maximum audio flexibility, the DVD-A160 has a bitstream digital output for external Dolby Digital, MPEG2 or DTS surround sound decoders. The Advanced Virtual Surround Sound effect operates with Dolby Digital 5.1, 5.0 and 2.0 channel discs. This Panasonic technology simulates surround-channel sounds using only two front speakers — allowing enjoyable viewing of DVD movies without a multi-channel audio system. It has been enhanced for the

Portable speakers for PA

Claimed to set a new sound-for-pound record, JBL's flexible EON 1500 loudspeaker system is designed for use as a floor, ceiling, wall or tripod mounted PA speaker or as a dual angle floor monitor.

Extremely lightweight and portable at just over 17 kilos, the new 15" two-way passive system features the acclaimed 'EON sound' and comes in an extremely rugged black enclosure that stands up to impact that would break the joints on conventional housings. Its components include a liquid cooled titanium diaphragm compression driver, an integral 60° x 90° constant directivity horn, and JBL's patented SonicGuard circuitry which protects the compression driver from overpowering. Dual 1/4" phone jack inputs and attachment points for wall or ceiling brackets are provided, along with an integral 35mm pole mount.

The JBL EON 1500 is distributed by Jands Electronics. For more information or your nearest JBL dealer, call Jands on (02) 9582 0909.

DVD-A160, with an even wider listening range from left to right.

Panasonic's Dialogue Enhancer feature is designed for viewing Dolby Digital 5.1-channel movie discs, and automatically increases the centre channel volume relative to the other channels for improved clarity of speech in scenes with loud ambient sound levels.

The DVD-A160 uses a 96KHz/24-bit audio D/A (digital-to-analog) converter for outstanding sound, and a 10-bit video D/A converter which virtually eliminates video noise and maximises picture quality.

In addition to PAL system DVDs, the DVD-A160 lets users play back NTSC titles, with a choice of output signal type: PAL60 (for PAL TV) or NTSC (for multi-system TV). It will also play audio and video CDs. The DVD player is Regional Code 4.

For still picture display, the user can see which of the three MPEG2 compressed video frame types (I/P/B) is being displayed, and select the 'I' image for optimum quality.

For more information contact Panasonic Customer Care on 132 600.

New Philips 'flicker-free' TV

Philips says its new 32" (82cm) Design Line Matchline 'Cool Green' TV is for the discerning viewer who wants more than just excellent picture and sound quality. It's an elegant piece of design furniture, as well as incorporating top-end Philips TV technology...

The set has a relaxing light grey/green finish, which blends with most modern interiors yet still stamps its own personality on the room. It also comes with a classy, specially designed stand, which has a glass shelf beneath the TV for the DVD.

Adding to the contemporary design, the set uses 100Hz Digital Scan technology, in which Philips is a leader, to give the viewer an extremely stable, 'flicker free' picture that is more relaxing to watch. Philips' Crystal Clear picture enhancement technology also gives an even sharper picture, while an ultra-flat BlackLine S tube minimises distortion and produces a larger effective viewing area. The home cinema is complete with the 16:9 widescreen format and Incredible Surround sound, for a realistic audio experience.

The model 32PW9523 Design Line Matchline has an RRP of $4499 (including matching stand). For more information call Philips Electronics on 1300 363 391 or visit their website at **www.philips.com.au**.

WHAT'S new in the ever-changing world of electronics

Wireless headphones use FM

Philips says its new FM headphones are the latest in sophisticated wireless technology, allowing you to receive the superb sound of your hifi system or TV from anywhere inside or

outside the home. It doesn't matter if you're in the kitchen, bathroom, garage, or even next door. Unlike infra-red models (where you need to be in line of sight) these FM units give you the same great quality sound within a range of 100 metres — through glass, doors and walls.

The phones are elegantly styled (they won a 1998 European Design Award) and super lightweight with a self-adjusting inner headband and full-size earpads for maximum comfort. Other features include an automatic level control to ensure optimal signal reception; the ability to use multiple headphones and/or wireless speakers with one transmitter; auto-muting for noise free operation; automatic power on and off; and a rechargeable system with AC/DC adaptor included.

The Philips model SBC HC480 FM Headphones have an RRP of $199. For more information call Philips Electronics on 1300 36 3391.

Entry-level 8mm camcorder from Hitachi

Designed to complement the recently introduced Hitachi 'Gold-Series' camcorders, the new model VM-E358E has an RRP of only $949 but features up to 300X zoom, a third generation DSP processor for special effects and low-light recording down to 0.3 lux — features normally found on more expensive cameras.

A new lithium-ion battery gives an extended recording time of two hours, with five-hour and 11-hour batteries optional. The new batteries are small and lightweight for easy transportation.

The new camera offers a wide range of zoom controls to get really close to that important subject. The standard optical zoom of 16X is enhanced by a 72X digital zoom, and an 'instant zoom' of 1.5X at the touch of a button.

The special DSP processor also offers users special digital effects such as 16x9 panorama, mosaic and digital fade controls to enhance creativity and viewing pleasure. Advanced titling and labeling further enhance functionality while Hitachi's advanced 'Artificial Intelligence' processor helps create perfect

MPEG-1 video editing package

Pinnacle Systems' Studio MP10 MPEG-1 video editing solution for Windows 95 and 98 now opens the door to anyone who wants to produce videos, multimedia CD-ROMs and video for the Internet in three easy steps, without the expense of complex video editing suites.

The MP10 allows users to capture in real-time MPEG-1 compressed video combined with audio, edit it, then output your finished video clip to an MPEG-1 file, Video CD, Internet or back out to VHS tape.

The latest hardware in the popular Studio range of video editing products, the Studio MP10 is an external (parallel port) MPEG-1 capture and output device which incorporates advanced hardware MPEG-1 technology that compresses digitized video and audio to up to 200:1 as you record to your PC. The MP10 provides composite, S-Video and RCA Audio Input/Outputs that allow users to connect their camcorder or VCR and start recording video straight into their hard disk in MPEG-1 format while keeping accurate audio and video synchronization. With MP10, you can record up to one hour of video for every 1.5GB.

The MP10 combines real time MPEG-1 encoding and decoding with Pinnacle's easy-to-use Studio video editing software. Studio provides the user with powerful features like automatic scene detection, instant preview of all edits and effects, intelligent rendering for saving rendering time, drag and drop editing and an 'Album' for holding video clips and other media. Underneath the user-friendly graphical interface, Studio uses advanced software technology for frame accurate MPEG IBP editing and high-resolution still image capture at up to 3840 x 2880 pixels.

The Pinnacle Studio MP10 is available now from Lako Vision for an RRP of $699. For more information contact Lako Vision on (03) 9852 7444 or visit their web site at **www.lakovision.com.au**.

balanced pictures every time. An advanced remote control is said to make the new camera a 'snap' to use.

For more information visit Hitachi's web site at **www.hitachi.com.au**.

Digital map measuring meter

Dick Smith Electronics is now offering a handy Digital Map Measuring Meter that accurately measures the distance between two points on a map, plan or physical object. The user simply traces the line to be measured with the serrated wheel and the length measured in millimetres is shown on the digital display.

The meter has a built-in calculator so the distance on the map or drawing can then be multiplied by the scale to give an accurate measurement. In addition, a magnifying glass is also built-in for easier reading of maps.

The Digital Map Measuring Meter is available from Dick Smith Electronics stores Australia-wide and Dick Smith Electronics Powerhouse stores at Penrith, Bankstown, Moore Park in NSW and Carnegie in Victoria, for an RRP of $39.95 or via mail order by calling Dick Smith Electronics Direct Link on 1300 366 644.

Pocket IR thermometer

Raytek's new MiniTemp pocket-sized thermometer is claimed to put affordable, non-contact temperature measurement in the hands of trades people and home users, as well as industrial technicians. Priced comparably to hand power tools, it measures at distances up to 1.8m in less than a second, and has literally hundreds of uses.

The MiniTemp model MT2 has measuring range of -18 to 260°C (30 - 500°F) and has a backlit digital display. The model MT4 offers the addition of laser sighting for accurate aiming. Operating power for both is provided by a 9V alkaline or NiCad battery. Applications include checking food display and storage, HVAC equipment, engines and machinery, electric fuse boxes and domestic appliances, where temperature variances can give an early indication of problems.

For more information visit Raytek Corporation's website at **www.raytek.com**. ❖

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Kenwood's KRF-V8881D AV Surround Receiver

Featuring five full channels of power amplification, each rated at 130W RMS output, the Kenwood KRF-V8881D is a good example of the 'new breed' of receivers and amplifiers designed for the digital surround sound era. As an extra bonus it offers not only a Dolby Digital (AC-3) decoder inbuilt, but a decoder for DTS as well — each able to accept either electrical or optical bitstream input.

BY JIM ROWE

IF YOU WANT to be able to enjoy the full impact of digital surround sound from your new DVDs, one way or another you'll need the appropriate decoder. In the case of most DVDs that means a decoder for Dolby Digital (formerly called AC-3), as most of the discs have at least this type of track. However a small number of discs have MPEG (Motion Picture Experts Group) audio encoding, while another small group of titles have DTS (Digital Theatre Sound) encoding — both of which need a different decoder again.

It's true that some DVD players do have a built-in Dolby Digital decoder, able to deliver the full six analog channel outputs (from discs with DD 5.1 tracks) ready to drive external amplifiers. Kenwood's own DVF 9010, DVF-K7010 and DVF-5010 all do this, for example, and this certainly allows you to achieve fully satisfying digital surround sound from the majority of DVDs. But if you particularly want to do the same with discs having MPEG or DTS tracks, you'll have to use either the electrical or optical 'bitstream' outputs from the player to drive a different matching decoder. That's why the manufacturers are starting to produce surround sound amps and receivers with more than one decoder built in.

At the time of writing, the KRF-V8881D is Kenwood's top of the line AV surround receiver — although I've just been advised that along with the rest of the current range, it's about to be superseded (see sidebar 'Kenwood's new receivers'). The new models do offer higher output, a few extra features and an enhanced user interface, but it seems they're not drastically different from current models like the KRF-V8881D. So the basic description given here should still apply, in the main.

Perhaps the feature of the V8881D that's most interesting is its flexibility in terms of surround sound decoding. Not only does it provide decoders for both Dolby Digital and DTS, both able to accept either electrical or optical bitstream input, but it also offers a range of other options for achieving the most satisfying sound from stereo and 'analog surround' material. For example there's a Dolby Pro-Logic decoder for material with this type of decoding (for example from DVDs with 'Dolby Surround' tracks), while for straight stereo material there's a high performance Motorola DSP chip capable of creating your choice from a range of adjustable synthesised sound fields: 'Arena', 'Jazz Club', 'Stadium', 'Cathedral' and 'Theatre'.

To complement this decoding flexibility the V8881D also offers an impressive range of surround configuration and setup facilities, to set up your system properly. There are both 'Quick Setup' and 'Custom Setup' modes, for example, and in the latter you can quickly configure the V8881D according to the number of speakers you're using, their size (i.e., power handling/bass response) and sensitivity (i.e., channel level adjustment for balancing) and their distance from the main listening position (to adjust time delay).

It can all be done quickly and logically, and there's even a built-in test tone which the V8881D can either send through any particular channel/speaker in Manual mode (for balancing accurately using a sound level meter), or through each of them in sequence in Auto mode (for approximate balancing by ear).

As you can see, the KRF-V8881D's remote control is quite unusual, with a relatively large LCD screen. It receives status data from the receiver as well as sending it...

A lot of this setup and configuration is done using the V8881D's remote control, which is much larger than most — and looks a bit more like a handheld videogame console. As you can see from the photo it has a large backlit LCD screen, and far fewer buttons than usual: one for power on/off, one for sound muting, two for volume Up/Down, one to Confirm an on-screen selection (a kind of second Enter key), and a large Joystick/Enter key which is used to negotiate around the on-screen GUI and its menues.

As well as being a two-hand job, the remote is also two-way in terms of communications — not only sending information to the V8881D, but also receiving data from it to indicate system status, etc. To preserve battery power (it uses four AA alkaline cells), it also includes an auto power-down function.

The amplifier's digital inputs can accept bitstream data at sampling rates of 32kHz, 44.1kHz or 48kHz, with the optical input expecting a wavelength of 660nm (+/-30nm). The electrical input is designed to accept the standard 0.5Vp-p into 75Ω.

Supporting this impressive decoding and DSP capability, the V8881D provides five husky power amplifier channels each with a rated output capability of 130W RMS into 6Ω for less than 0.7% THD (total harmonic distortion), with one channel driven. The same rating also applies to the two front channels when both driven together.

Rated THD for any channel at 65W into 6Ω at 1kHz is less than 0.004%, with a basic frequency response (CD inputs) of 5Hz - 80kHz (+0.5dB, -3dB) and a S/N ratio (CD inputs) of 92dB.

Although there's no inbuilt power amp for the subwoofer ('0.1') channel, this output from the decoders is brought out to a line level output (1V/1kΩ) at the rear of the V8881D, to feed an active subwoofer. Also provided are similar line outputs from the Centre and Surround L/R channels, presumably for those who want to use additional or alternative power amps for these channels.

A feature of the V8881D's power amplifiers is the use of Kenwood's special 'TRAIT' (Thermally Reactive Advanced Instantaneous Transistor) output devices in the PA stages. These apparently have temperature sensor elements fabricated right on the power transistor chip itself, for the fastest and most accurate sensing and bias current adjustment. As a result Kenwood claims that the TRAIT output stages have significantly improved dynamic characteristics — much lower distortion of low-level signals following high level passages, for example, along with lower noise.

When it comes to inputs and signal sources, the V8881D provides stereo analog audio inputs for magnetic pickup (Phono), two CD players and MiniDisc/Tape, plus further stereo analog audio inputs from two VCRs, a DVD player and a Laserdisc player.

Kenwood's New Receivers

Just as this review was being prepared, we were advised by Kenwood Electronics Australia that the KRF-V8881D and other members of the existing Kenwood range would be superseded, by the time you read this review.

The new range extends from a brand new top of the line model KRF-V9992D model ($3499) right down to the economy KRF-V5020 model ($499). All models sport five full amplifier channels, with power ratings ranging from 180W RMS/channel for the V9992D down to 80W/channel for the V5020, but understandably the various models also differ considerably in terms of surround sound decoding capabilities, remote control functions and other 'frills'.

For example the V9992D offers both Dolby Digital and DTS digital decoding, in addition to Dolby Pro-Logic and DSP. It also offers a very impressive touch-screen LCD remote, with an advanced '3D graphics' GUI. Other features include six 20-bit DACs for lower distortion and noise on surround decoding, and banana-plug compatible speaker terminals for easier connections.

At the other end of the range, the V5020 offers only Dolby Pro-Logic and 3-stereo decoding plus DSP built-in, but also provides six-channel discrete analog inputs for use with an external digital surround decoder.

The new model which apparently replaces the V8881D unit reviewed here is the KRF-V8882D, which offers increased output (5 x 180W RMS), the 20-bit DACs for improved surround decoding and also the banana-plug compatible speaker terminals. Other enhancements include twice as many digital inputs (two coaxial, two optical) and variable input sensitivity for each input channel, with individual 'memory' storage.

The new KRF-V8882D is priced at $2399.

The latter are in addition to the electrical and optical bitstream inputs. There are also stereo audio recording outputs for both MiniDisc/Tape and VCR1, separate from the line level outputs for external amplifiers.

There's also a range of video (S-Video and composite) inputs, and a pair of outputs, so that the V8881D can be used to select the accompanying video source for viewing.

Note, though, that there's no six channel, discrete analog surround audio inputs — the kind you'd need in order to make use of an external decoder for MPEG compressed digital audio, for example, or some other yet-to-be-announced format. The additional of such inputs would have made the KRF-V8881D more 'future proof'.

Needless to say, since the V8881D is a receiver rather than just a multi-channel surround sound decoder and amplifier, it also provides both AM and FM stereo tuners for AM reception. These have 40 preset memories programmable at random for your favourite stations, and all the usual options for world reception such as switchable 9kHz/10kHz AM channel spacing, etc.

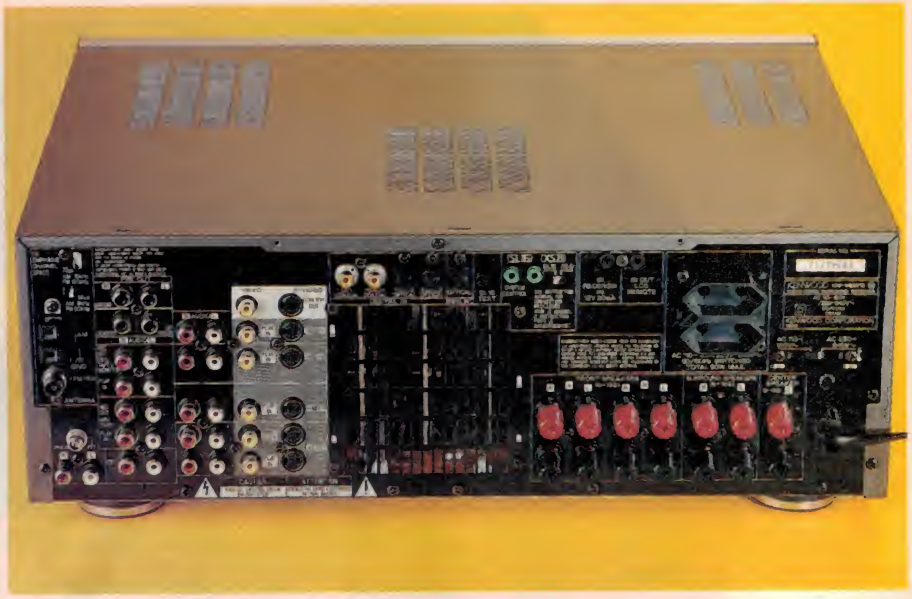
What we found

Before attempting to make any measurements on the KRF-V8881D, I tried it out in a home listening situation. It was hooked up to a Kenwood DVF-5010 DVD player, via both the electrical and optical bitstream links (to allow a choice between the two), to allow watching a range of DVDs with different sound tracks. On the output side, it was connected to a Jamo 'Apollo' speaker system, consisting of five of their Omega satellite speakers plus their SW-410E active subwoofer (connected via the tapoff/filter box).

To be honest I did find setting up the V8881D a bit tricky, mainly because of the somewhat complicated and not-terribly-intuitive operation of the fancy remote control. The user manual isn't as helpful here as it might be, and what also didn't help was that auto power-off function in the remote, which often seemed to turn the unit off just as I was working out where to negotiate the cursor to achieve (or try to achieve) the desired action...

Another minor niggle was that the screw terminals provided on the back for the speaker connections are quite closely spaced, and don't accept standard banana plugs. You have to introduce the ends of the leads through slots in the skirts at the base of the terminals, and it's all a bit awkward and fiddly.

After the V8881D was hooked up and correctly setup to suit the Jamo system, though, my family and I watched a number of DVDs over a week or two, and we were basically very happy with the quality of sound. Whether we were watching discs with full Dolby Digital 5.1 tracks, Dolby Surround or Dolby 2.0 stereo, the sound was very clean indeed, and with plenty of power for the 'loud bits'. This applied equally to the electrical and optical bitstream inputs, by the way.



As with most of the latest AV amps and receivers, the rear of the KRF-V8881D has plenty of inputs and outputs — including quite a few for video, so it can act as a video switcher as well.

Thus encouraged, I managed to acquire a DVD (actually a set of two) with DTS 5.1 Digital Surround sound (*Dances With Wolves*), and eagerly tried playing it to experience for my first time the thrill of home DTS. Alas I was greeted with silence, although the V8881D would happily play the Dolby Digital Stereo 4.0 track also provided on the same disc set.

After ringing the technical people at Kenwood, and following their helpful suggestions (including properly enabling the bitstream output from the DVF-5010, for DTS tracks), I still couldn't manage to hear any DTS sound. We had to conclude that the review KRF-V8881D somehow had a faulty DTS decoder. Ah well, next time maybe!

Apart from the lack of joy with DTS, though, the listening tests were very successful and impressive. So with help from technical editor Rob Evans, we carried out some basic measurements on the receiver.

We were able to confirm the power output and distortion figures quite happily, in fact achieving 160W RMS into 8Ω loads with one channel driven, or 130W RMS into 8Ω with two channels driven. The THD at 100W into 8Ω was also below 0.06% with no HF filtering, or below 0.04% with an 8kHz top-cut filter. The signal to noise figure at the CD inputs also checked out at very close to the rated 92dB.

We did strike trouble when we tried to check out the transient recovery characteristics, however — to get an idea of the performance of those TRAIT output devices. At this stage the review unit seemed to develop a fault of some kind, either in the power supply or the output stages, and further measurements proved impossible.

Despite the problems encountered with the particular unit we had for review and testing, though, our impressions of the Kenwood KRF-V8881D are that it's a solidly built, high performance digital surround sound receiver which would make a good choice for the centrepiece of a home theatre system. ❖

Kenwood KRF-V8881D AV Surround Receiver

A husky AV receiver offering five 130W RMS power amplifier channels, plus inbuilt decoders for Dolby Digital and DTS digital surround sound, Dolby Surround Pro-Logic surround and DSP virtual sound fields. Measures 440 x 391 x 162mm, weighs 12kg. Large multi-function bidirectional remote control with backlit LCD display.

Good Points: *Five power amp channels with clean, high output; built-in Dolby Digital and DTS decoders as well as Pro Logic and DSP. Both co-axial and optical bitstream inputs, with automatic signal ID and decoder selection.*

Weak Points: *No six-channel analog inputs to allow use of additional external decoders; remote control is not very user friendly, especially with the auto power-off function; speaker terminals closely spaced, don't accept banana plugs.*

RRP: *$2299*

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What to Look for in a DVD Player

The new DVD players just starting to appear on store shelves both here and overseas offer many enhancements compared with those released even earlier this year: more functions and features, and often significantly better performance — quite often for a lower price as well. Here's a guide to what the various bells and whistles on the new players are likely to mean for you...

BY JIM ROWE

WHEN ANY NEW technology is released onto the market, the first models are often fairly basic in terms of functions and facilities, while at the same time carrying a fairly hefty price tag. This means they often appeal mainly to the people who 'must be first in the street to have one', and are prepared to pay a premium for that privilege. Up until very recently, DVD players have been in essentially that position.

Once the market for the new technology 'warms up', though, with more manufacturers competing and more people starting to consider a purchase, models offering better value for money soon begin to appear — especially if the technology itself is undergoing rapid development, to make such improvements possible.

And that's really where we are *now* with DVD players: the 'next generation' models are now appearing on the market, offering quite significant enhancements in terms of functions and features. In many cases the basic performance is also improved as well, and all for a price that's often significantly lower than the early models.

As luck would have it, the log-jam has also started to clear in terms of movie titles being released regularly in markets like Australia and New Zealand. So overall it's basically good news for those who have been prepared to wait until now, before entering the DVD revolution.

Let's have a look at the functions and features found on the latest generation of DVD players, and especially those which represent enhancements over what's been the norm on earlier models. We'll also try to explain what benefits these enhancements are likely to deliver to you, the consumer.

The basics

First of all, let's look quickly at the basic features and functions that have been provided even on most of the earlier models. The bare essentials, if you like.

Clearly at the very least, a DVD player has to be able to play DVD movie discs for the region it's sold in (Region 4, for Australia and New Zealand), and deliver video and audio out to your TV set and/or hifi system. So even the first players have provided a standard composite video (CV) output, plus a pair of line-level analog stereo outputs. All of these outputs are directly equivalent to those you get on a standard stereo VCR, for playing videotapes. They use the same familiar 'RCA' or 'phono' sockets, with the video output usually colour-coded yellow and the two audio outputs coded red and black.

Now although the video quality encoded

on most DVDs is much better than that on VHS videotapes, the improvement you'll see when you hook up the DVD player's CV output to your TV set or video projector generally isn't that noticeable. That's because the circuitry involved in combining the video's luminance ('Y', or black and white detail) and chrominance ('C', or colour) information, in the player, and then separating them again in your TV, tends to degrade the picture clarity and introduce subtle distortions (including those dynamic mauve Moire patterns that appear on fine details, like striped shirts).

To give the possibility of achieving more of the excellent picture quality possible with DVDs, some of the better players have been provided for some time now with a second video output: the S-Video output, which you can generally recognise because it uses a small 4-pin 'DIN' socket. With the S-Video output the Y and C information are kept separate, to avoid at least some of the problems caused when they're combined.

Just about all of the latest DVD players now provide an S-Video output as standard, and it certainly provides the potential for better clearer and more satisfying picture quality. But of course this assumes that you have a TV set or projector with a matching S-Video input, so you can take advantage of the better signal. Otherwise you'll be forced to use the CV signal, at least until you upgrade to a newer or larger TV with the S-Video input.

Samsung's DVD-907, which offers RGB component video outputs and also inbuilt Dolby Digital surround sound decoding.

Even better video

As it happens, though, even the S-Video output signal can't allow you to achieve the *full* picture quality that's encoded on the best DVD software. That's because when the video information is digitally encoded on a DVD, the colour information is actually stored in two 'components': the 'B-Y' and 'R-Y' signals. So there's some degradation even when a DVD player's circuitry combines these to produce the 'C' signal for the S-Video output.

To avoid even this problem, and therefore provide at least the potential for achieving the full picture quality possible with DVDs, some of the better new players therefore provide further video outputs again: the *component video* outputs. Typically these deliver the three basic video signals that are recorded on the DVD: Y, B-Y and R-Y. Generally these are provided via three more RCA sockets.

Alternatively, a small number of players process the three signals to produce three high-res colour signals: R (red), G (green) and B (blue). These are generally brought out to the appropriate pins of a SCART AV connector, as used in some European TV sets, satellite receivers and VCRs.

Either way, of course, you can only take advantage of either Y/B-Y/R-Y or R/G/B component video signals from the DVD player if you also have matching inputs on your TV set or video projector. But even so, it's clearly an advantage to have these extra 'premium' outputs on the player you buy, because you may want to take advantage of the better picture quality down the track...

The audio side

Now let's look at the audio side. First of all, you should know that as well as being encoded in digital form, the sound on many movie DVDs is not just mono or stereo (although some are, especially with older movies), but compressed multi-channel surround sound. So there's quite often four, five, six or even eight channels of surround sound information recorded on the disc, and potentially capable of being used to create the same sound impact that you'd get in a city theatre.

In most cases this multi-channel sound is encoded using the Dolby Digital system, which is capable of encoding virtually any number of channels up to six — or strictly '5.1' channels, where the '0.1' channel is a low-frequency effects (LFE) channel. (See box 'DVD Audio Information'.)

The Sharp DV 880X, which offers an unusual feature: twin disc trays, for continuous playing of CDs. It also features an inbuilt Dolby Digital/MPEG2 surround decoder.

As an alternative to Dolby Digital encoding, some DVD movie discs use MPEG2 digital encoding (capable of giving up to '7.1' channels), DTS or 'Digital Theatre Sound' encoding (capable of 5.1 channels), or perhaps uncompressed LPCM sound like that used in audio CDs (and basically only capable of encoding mono or two-channel stereo).

Given all of these options and possibilities, then, exactly what does come out of those two basic 'stereo audio' sockets on the back of even the first DVD players — which are still present on all of today's models? And how are these stereo signals derived from the encoded audio information on the discs?

Well, inside the first generation of DVD players there's a kind of 'no frills' Dolby Digital/MPEG2 decoder, which decodes what is called a 'mixed down' version of the encoded multi-channel information. In most cases, regardless of whether the disc has encoded stereo or multi-channel surround sound, the internal decoder simply produces a pair of synthesised stereo outputs, designed to produce a reasonably satisfying stereo image. Of course if the disc has only digitised mono sound anyway, the mixed-down outputs produce identical signals for a mono sound image.

This then is the basic level of sound decoding in a DVD player, giving you a pair of 'stereo' outputs which can generally give quite reasonable sound via your hifi system or stereo TV. Depending on the sound encoded on the DVD you're playing, they can even give a modest surround sound effect, if you feed them through a Dolby Pro-Logic decoder or perhaps a simple Hafler-type matrix decoder.

Multi-channel sound

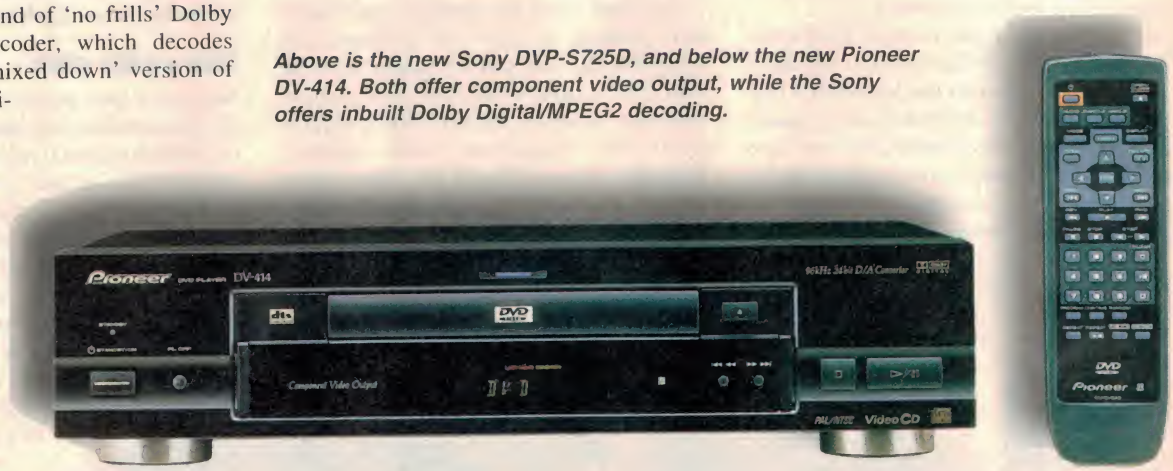
But to achieve the full impact of the discrete multi-channel digital surround sound recorded on DVDs with Dolby Digital 5.1, MPEG2 5.1/7.1 or DTS encoded sound tracks, you need to fully decode these tracks with the right decoder.

Instead of trying to build in a full Dolby Digital or MPEG2 decoder into the player, the makers of some early models provided them with a 'bitstream' audio output — essentially all of the undecoded digital audio information from the disc, pouring out in a steady stream so that it can be fed to an external decoder. A decoder in an AV amplifier or receiver, for example.

In fact two different kinds of these bitstream outputs soon emerged. One is electrical, where the digital bitstream appears on a standard RCA socket, ready to feed to the decoder via a standard coaxial cable. The other is optical, where the bitstream is used to modulate the light from a small semiconductor laser — ready to feed to the decoder through a short length of fibre-optic cable.

Nowadays most DVD players tend to have both kinds of bitstream output provided as standard. So on the back, you'll generally find an RCA socket labelled 'Digital Output: Coaxial' or similar, next to a small black receptacle (often fitted with a matching black dummy plug to keep out dust) marked 'Digital Output: Optical'.

With many of the modern players, although by no means all, the internal circuitry can also recognise sound tracks encoded with the DTS digital compression system, and output this digital audio information through the bitstream outputs as well. This is basically what's meant by the description 'DTS Compatible' or 'DTS Digital Output', and the corresponding logo that appears on the front of the players concerned. It *doesn't* mean that they're capable of decoding DTS sound tracks — just recognising them (many early players couldn't) and squirting them out of the bitstream outputs. You still need a DTS decoder in your amplifier or receiver, to turn the DTS encoding into audio.



Above is the new Sony DVP-S725D, and below the new Pioneer DV-414. Both offer component video output, while the Sony offers inbuilt Dolby Digital/MPEG2 decoding.

Incidentally many players (including many of the new models) are not capable of giving any kind of acceptable audio from their mixed-down analog stereo outputs, from a DTS sound track. You get either silence or a nasty 'digital noise', capable of damaging your stereo system and its speakers (and perhaps your ears). So it's best not to even try playing the DTS tracks on discs which have them (they're clearly identified), unless you have the correct DTS decoder available.

Above is Panasonic's new DVD-A160, with the Sharp DV 550X at lower right.

Luckily there aren't many DVDs with DTS tracks as yet, and those which do generally have a Dolby Digital stereo or Surround track as well — so you can get acceptable sound from the mixed-down outputs by choosing this track instead. But you may want to make sure that the player you buy is at least DTS compatible, so that if these discs become more popular — and DTS decoders become more common in AV amplifiers and receivers — you'll be able to play them in their full glory later on.

Full decoding

There are now a growing number of AV 'surround sound' receivers and amplifiers which incorporate full discrete digital multi-channel decoding, as opposed to 'analog matrix' decoding such as Dolby Pro-Logic or its cheaper relations. In other words they are provided with full Dolby Digital, MPEG2 and DTS decoders (or at least one of these), with inputs for coax/optical bitstream digital audio.

This type of amplifier or receiver obviously makes it very easy to achieve the full impact of digital surround sound from your DVDs — you simply hook up one of its digital inputs to a bitstream output of your player, with either a coax or optical cable.

But not everyone has one of these new (and fairly expensive) 'digital surround' AV receivers or amplifiers. In fact a large number of us have quite good stereo or analog surround sound systems, which we'd like to use for at least a while longer.

To increase the appeal of their products to people like us, some of the DVD player manufacturers have started to provide models with built-in full Dolby Digital and/or MPEG2 decoders. These players have an additional six line-level analog audio outputs on the rear — five for the decoded main channels (front left, centre and right, and rear left and right), plus the sixth providing the '0.1' LFE channel (for a subwoofer).

With these players, you're now able to achieve full decoding and impact from at least Dolby Digital (and perhaps MPEG2) sound tracks, simply by feeding the decoded outputs to some suitable amplifiers and speakers. So if you *are* one of the people who'd like to use some existing amplifiers and speakers to achieve full digital surround sound, this type of DVD player is probably the kind for you.

As far as I'm aware, none of the latest generation of DVD players has a full internal decoder for DTS. However as only a relatively small number of discs have DTS tracks as yet, this probably isn't too much of a problem.

I should note here that some of the latest players include an inbuilt 'Virtual Dolby' audio processor, either instead of an inbuilt Dolby Digital multi-channel decoder or as well. Generally the idea of this kind of feature is that the player can give you a 'virtual' or synthetic surround sound effect from a stereo amplifier or TV set, fed from the mixed-down stereo outputs and driving just two speakers.

In fact most DVD players make very good CD players indeed, with a flatter frequency response and better distortion and noise levels than most regular CD players

If you're not really able to use a complete set of amplifier channels and speakers, this can be a very nice feature — giving you at least a modest surround sound effect for a minimum outlay.

Other features

We've now covered most of the video and audio features that you'll find on the current breed of DVD players, and hopefully given you enough insight to decide which ones are going to be of importance to you. It remains to discuss some of the extra bells and whistles that are hidden away in some of the players, because you might want to look out for these as well.

Most modern players have a remote control, and you can use this in conjunction with a menu of control options which appears on your TV or projector's screen. This generally makes it a lot easier to change the player's settings for things like which language it uses to display subtitles (if at all), which of a disc's sound tracks you want to hear, whether you're using a standard 4:3 TV or a 16:9 widescreen model, which way it displays widescreen movies ('letterbox', with black strips above and below, or 'pan and scan' with the sides of the picture cropped off), and so on.

If the player is one with a built-in Dolby Digital and/or MPEG2 surround decoder, it may also provide a configuration mode which makes it easy to set up the decoder. Generally this gives you an on-screen image of a set of surround speakers, with options so you can easily program in how many speakers you're using, whether they're big or small, how sensitive they are and how far they're spaced from your main listening position, etc. Often there's a built-in 'pink noise' test signal which can be used to check the balance between all of the channels, to make sure you've set them up correctly.

Without this kind of facility, setting up a six-channel surround sound system can be quite fiddly and time consuming — but with it, the job is generally quite quick and straightforward.

CD compatibility

Right from the start, virtually all DVD players have also had the ability to play standard audio CDs — i.e., being able to double as a CD player. In fact most DVD players make very good CD players indeed, with a flatter frequency response and better distortion and noise levels than most regular CD players. Some of the quite modestly priced models have even turned out to be quite superb CD players, with sonic performance that's outstanding.

The only point to remember here is that in many cases, this excellent performance *only* applies for standard commercially pressed CDs — that is, the kind you buy in music shops. It generally doesn't apply for CD-R or CD-RW discs (the kind made on computer 'CD writers' or CD audio recorders). In fact most DVD players won't play these discs at all, because the laser in their optical pickup works at a wavelength which makes them 'blind' to the dye-layer recording medium used in CD-Rs and CD-RWs; it only responds to the reflective metal medium in pressed CDs and DVDs.

There are a small number of DVD players which *will* play CD-Rs and CD-RWs, but you have to seek them out. Generally they work by using two different lasers in their pickup — one with the best wavelength for DVDs, and the other with the best wavelength for CDs and CD-Rs/CD-RWs.

By the way most DVD players are also compatible with the older Video CDs, as used mainly in China and various other Asian countries. But again, only those which have a dual laser pickup will be able to play video CD-Rs.

Many of the early DVD players were fitted with a stereo headphone jack and volume control on the front panel — probably as a carry-over from CD players. Quite a few of the latest DVD players offer this feature too, and it can actually be quite handy. For example if you want to watch a movie at night without disturbing others, it lets you do so very easily; you don't have to even turn on your main amplifier system.

On the other hand a smaller proportion of the latest players also offer a Karaoke facility — basically a pair of microphone inputs, again with their own volume controls. These allow you to 'sing along' with special Karaoke DVDs, where there's music for various songs without the lyrics (or the lyrics are on a special track that the player 'mutes' when you sing into the mike). Whether this facility is of much value to you will depend on your enthusiasm for Karaoke...

In the marketing material for many DVD players, you'll find impressive looking claims like '10-bit video DAC for better picture quality', '24-bit audio DACs for superb audio', etc. To be honest, these features are now pretty common on most of the new models. Most of them *are* capable of excellent picture and sound quality — especially if you're able to achieve their full potential by using their component video outputs and bitstream digital audio outputs.

What then separates the 'economy' DVD players, priced at say $1000 and below, from the considerably more expensive 'reference' models priced at above $2000? Often not a huge amount, in terms of either specifications or performance aspects that you and I are capable of detecting with our unaided eyes and ears. The performance of some of the cheapest models in the latest generation of players is now so good that the picture and sound quality are basically limited not by the player, but by the encoding on each DVD. (These can vary quite noticeably, as you might expect.)

Basically the differences between the cheaper and more expensive players often seem to get down to quite subtle things: the sturdiness, reliability and smooth running of the pickup and player mechanism, the speed control accuracy of the disc drive system (some have a higher performance phase-locked loop), the linearity and noise performance of the DACs in the video and audio decoders, and so on.

Most of us probably can't even detect the subtle improvements in performance provided by these refinements. But for those who *can* (or believe they can), and have the money to afford them, the expensive 'reference' models are there so you can make sure you get the very best performance achievable with current technology.

DVD Audio Information

1. Dolby Digital Mono
This program features a mono soundtrack encoded to an AC-3 bitstream. When played through Dolby Digital equipment, sound will be heard from the center channel speaker only.

2. Dolby Digital Stereo
This program features a stereo soundtrack encoded to an AC-3 bitstream. When played through Dolby Digital equipment, sound will be heard from the front left and front right speakers only.

3. Dolby Digital Surround
This program features a matrixed surround soundtrack encoded to an AC-3 bitstream. When played through Dolby Digital equipment, sound will be heard from all five system speakers. The surround information will be monophonic.

4. Dolby Digital 4.0
This program features a discrete four channel soundtrack encoded to an AC-3 bitstream. When played through Dolby Digital equipment, sound will be heard from all five system speakers. The surround information will be discrete monophonic.

5. Dolby Digital 5.0
This program features a discrete five channel soundtrack encoded to an AC-3 bitstream. When played through Dolby Digital equipment, discrete sound will be heard from all five system speakers.

6. Dolby Digital 5.1
This program features a discrete 5.1 channel soundtrack encoded to an AC-3 bitstream. When played through Dolby Digital equipment, discrete sound will be heard from all five system speakers and a subwoofer.

7. PCM
This program features an uncompressed digital stereo soundtrack for improved fidelity. When played, discrete stereo sound will be heard from the front right and front left speakers.

8. DTS
This program features a discrete 5.1 channel soundtrack and must be played through DTS capable equipment. When played through DTS equipment, sound will be heard from all five system speakers and a subwoofer.

CURRENTLY AVAILABLE DVD PLAYERS - CAPABILITIES

BRAND & MODEL	Video outputs			Audio outputs				Inbuilt surround decoding				Headphone output	Surround sound setup mode	Resume play	Scanning at highest speed	Karaoke mode & mic inputs	Selectable Letterbox/P&S	DTS compatible (Bitstream out)	Able to play CDRs & CD-RWs	Price (rrp)
	CV	S-Video	Comp. Video	Mixed down Stereo	Bitstream digital		6 Ch. Surr.	DD (AC3)	MPEG	DTS	Virt. Dolby									
					Coax	Opt.														
DENON DVD-3000	2	✓	-	✓	✓	✓	✓	✓	✓	-	✓	✓	✓	✓	✓	-	✓	✓	No	$1799
DENON DVD-2500	2	✓	(RGB)	✓	✓	✓	-	-	-	-	✓	✓	-	✓	✓	-	✓	✓	No	$1499
GRUNDIG GDV-100D	✓	-	(RGB)	✓	✓	-	-	-	-	-	-	✓	-	-	?	-	✓	?	No	$1499
KENWOOD DVF-9010M	2	2	-	✓	✓	✓	✓	✓	-	-	✓	✓	✓	-	✓	-	✓	✓	No	$2199
KENWOOD DVF-K7010	2	1	-	✓	✓	✓	✓	✓	-	-	✓	✓	✓	-	✓	✓	✓	✓	No	$1699
KENWOOD DVF-5010M	2	1	-	✓	✓	✓	✓	✓	-	-	✓	✓	✓	-	✓	-	✓	✓	No	$1599
ONKYO DV-S717	✓	✓	✓	✓	✓	✓	-	-	-	-	-	✓	-	✓	✓	✓	?	✓	?	$1799
PANASONIC DVD-A350A	✓	✓	-	✓	✓	✓	✓	✓	✓	-	✓	✓	✓	?	✓	-	✓	-	No	$1699
PANASONIC DVD-A160	✓	✓	-	✓	✓	✓	-	-	-	-	✓	-	-	✓	✓	-	✓	✓	No	$1099
PHILIPS DVD-725	✓	✓	-	✓	✓	✓	-	-	-	-	✓	✓	-	✓	✓	✓	✓	✓	Yes	$1095
PIONEER DV-717	2	✓	(RGB)	✓	✓	✓	-	-	-	-	✓	-	-	✓	✓	-	?	✓	No	$1499
PIONEER DV-515	✓	✓	(RGB)	✓	✓	✓	-	-	-	-	✓	-	✓	✓	✓	-	?	✓	Yes	$999
PIONEER DV-414	✓	✓	✓	✓	✓	✓	-	-	-	-	✓	-	-	✓	?	-	?	-	Yes	$999
SAMSUNG DVD-907	2	✓	(RGB)	2	✓	✓	✓	✓	-	-	-	?	✓	✓	✓	-	✓	-	No	$1099
SHARP DV-550X	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	✓	✓	✓	?	?	-	✓	-	No	$1299
SHARP DV-880X	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	✓	✓	✓	?	?	✓	✓	-	No	$1499
SONY DVP-S7700	2	2	✓	2	✓	✓	-	-	-	-	✓	✓	-	✓	✓	-	✓	✓	Yes	$2500
SONY DVP-S725D	2	2	✓	2	✓	✓	✓	✓	✓	-	✓	✓	✓	✓	✓	-	✓	✓	No	$1395
SONY DVP-S525D	2	2	✓	✓	✓	✓	✓	✓	✓	-	✓	✓	✓	✓	✓	-	✓	✓	No	$1095
SONY DVP-S715	✓	✓	-	✓	✓	✓	-	-	-	-	?	✓	-	✓	✓	-	✓	?	No	$1499
TOSHIBA SDK-320Y	✓	✓	✓	✓	✓	✓	-	-	-	-	✓	✓	-	?	?	✓	?	✓	No	$1599
TOSHIBA SD-2108Y	✓	✓	✓	✓	✓	✓	-	-	-	-	✓	-	-	?	✓	-	?	✓	No	$1399
YAMAHA DVD-S795	✓	✓	-	✓	✓	✓	-	-	-	-	?	✓	-	✓	✓	-	✓	✓	No	N/A

Multi-region use

Finally, a few comments about the thorny issue of region coding and players that can be used to play discs coded for different regions.

As you may be aware, the big movie producers ('Hollywood') insisted that DVD discs had to have a region coding system, and players arranged so that those sold in each region will only play discs intended for that region. So players sold in Region 4 (which includes Australia and New Zealand) are nominally only able to play Region 4 discs, and so on. When you try to play a disc intended for some other region, the player normally refuses to play it. The idea is to allow the producers to maximise their profits, by controlling the release of movies in each region.

That's the theory, anyway — and when you buy any of the DVD players, it's officially only capable of playing discs for your region. However many Australian consumers have been rather unwilling to buy players on this basis (especially as until very recently, the range of titles available on Region 4 coded discs has been very limited). This has tended to encourage retailers in particular to explore ways of being able to provide their customers with players that are essentially 'multi-region capable'; in other words, capable of playing discs coded for virtually any region. Then the buyer is able to play 'Region 1' movie discs imported privately from the USA, for example, where there's many thousands of titles already available (and growing rapidly).

Of course to play Region 1 discs properly you also need a TV set or projector which can play NTSC (the American TV system) as well as PAL, but most recent models do this quite happily.

The fact is that many DVD players can either be modified internally to play discs for any region, or actually have this capability built-in anyway, as a 'secret function' supposedly intended only for access by service technicians. In some models the player can be set for virtually any region at will, simply by pressing the right combination of keys on the remote control.

Now you won't find mention of a player's multi-region capability in the sales brochures, because the manufacturers aren't allowed to tell you. Nor will you find a column about this in the comparison table accompanying this article, because we'd probably be sued by the software producers if we told you and supposedly incited you to break their code protection.

But most DVD player retailers seem to be well aware of the situation, and if you explain that you only want to buy a player that's multi-region capable, they are generally only too happy to arrange to provide you with what you want. Nudge, wink — need I say more? ❖

Philips DVD 725

In common with many of the other leading consumer electronics firms, Philips has released a 'next generation' DVD video player, the DVD 725. Compared with their initial models it offers improved performance and additional features, at an attractively low price.

BY JIM ROWE

MOST OF THE first generation of DVD video players gave quite acceptable basic performance playing DVD movie software, and often quite exemplary performance playing standard audio CDs. Nonetheless most of them were pretty basic in terms of functions and facilities, and lacked quite a few of the 'frills' that today's consumers are already expecting and demanding. Clearly they were sufficient to meet initial market demand, but manufacturers have inevitably had no time to waste in developing their 'next generation' models.

Happily this task has been made easier by rapidly moving chip technology, which is steadily reducing the number of chips and other components needed to perform laser pickup output signal processing and decoding of MPEG2 video and multi-channel digital surround sound decoding. So there's no doubt that DVD players are now out of the 'honeymoon' phase, and very much on their way down the 'more and more for less and less' track followed by most consumer electronics products.

Philips' sleek new DVD 725 is a good case in point. The first of the company's models to break the $1100 price point (street price $995), it nevertheless offers quite a few enhancements over the initial models — such as S-Video output in addition to CV (composite video), and both optical and coaxial digital bitstream audio outputs to drive external surround sound decoders. A Karaoke facility with dual microphone inputs is also built in as standard, even though this may not be a crucial factor for many Australian buyers.

The DVD 725 will happily play your CD-Rs (and CD-RWs) just as easily as normal pressed CDs or DVDs. Great news!

Another new feature is a Resume function, where a disc may be stopped and removed at any point in a movie, and play resumed automatically at that point when the disc is returned, even days later. The DVD 725 can 'remember' up to five discs in this way, a point which many users may find very appealing.

The DVD 725 is also more flexible in terms of image display format, allowing you to display widescreen movies in 'pan and scan' format on a standard 4x3 TV, instead of the 'letterbox' format that was more or less unavoidable with many initial player models. It will also happily play discs in either PAL or NTSC format — although it's basically fixed in terms of region coding.

There's no built-in decoder for multi-channel sound; you have to use an external decoder (i.e., in a suitable receiver of amplifier) for Dolby Digital, MPEG or DTS sound, in conjunction with one of the bistream outputs. However you do get a built-in virtual surround sound processor, to get an enhanced 'virtual 3D' effect when you use the player's mixed-down stereo audio outputs with a standard stereo hifi system. The virtual surround processor uses SRS TruSurround technology, licensed from SRS Labs Inc.

I mustn't forget to mention another nice feature of the DVD 725, either — one that most first-generation players definitely lacked, much to the horror of many of us: the ability to play home-brew CD-R audio and video discs. Thanks to its dual-laser pickup head, with

lasers working at both 650nm and 785nm wavelengths, the DVD 725 will happily play your CD-Rs (and CD-RWs) just as easily as normal pressed CDs or DVDs. Great news!

Rated video performance playing DVDs is pretty impressive, with a 10-bit video DAC giving good greyscale resolution and roughly 500 lines of horizontal resolution using the S-Video output and a good monitor or TV.

24-bit DACs are used in the inbuilt stereo/Pro Logic audio decoder (using the downmixed signals from multi-channel sound, or PCM from CDs), to achieve excellent waveform resolution and low distortion and noise. Rated frequency response for CDs is 4Hz - 20kHz, and for DVDs 4Hz - 22kHz. Signal to noise ratio is rated at 96dB (typically better than 100dB), with 90dB dynamic range, crosstalk better than 100dB down, and distortion and noise better than 85dB down.

By the way there's a built-in stereo headphone jack, with its own volume control, for personal late-night movie viewing or CD listening. There's also a selectable 'autoplay' function, and a nice programmable horizontal picture shift facility to allow you to centre its picture accurately on your TV/monitor screen.

Other more standard features include a built-in screen saver, closed caption facility, dual selectable audio and CV outputs, selectable on-screen status display language (quite separate from the disc audio and subtitle language) and a 'Parental Control' feature, whereby a PIN code must be used to play DVDs or Video CDs.

The DVD 725 measures a compact 435 x 305 x 68mm, weighs 4kg and draws only 20 watts when operating (5W in standby). It comes with a compact IR remote control, able to control virtually all aspects of player setup and operation.

What we found

Philips Electronics kindly sent us a sample DVD 725 to try out for a couple of weeks, and we were able to evaluate it with both a high quality 68cm stereo TV and a more elaborate home theatre system using an SVGA video projector, a new five-channel AV receiver with an inbuilt Dolby Digital decoder, and a Jamo Apollo 5.1 surround sound speaker system. In each case we were able to use the player's S-Video output to achieve improved video performance, while with the home theatre system we were also able to try out both the optical and co-axial bitstream audio outputs driving the receiver's Dolby Digital/Pro Logic decoder.

In both setups we used a range of DVDs for the overall evaluation, including a number of region 4 movie discs (with different audio track formats) and also the Video Essentials DVDI 0711 all-region (but NTSC video) system evaluation disc.

We found the DVD 725 very easy to setup and use, and in just about every case we were most impressed with both the picture and sound quality it delivered. Only with one DVD with an MPEG stereo sound track (the ABC/Video Arts disc of *La Boheme*) were we surprised, and that was by unexpectedly low volume rather than any other degradation. This was using either the bitstream or analog mixdown outputs.

We did find the player's remote control a bit fiddly at times, though, especially when trying to access a few infrequently-used functions. For example the Video Essentials DVD uses a rather arcane Title/Chapter format, and it was only on this disc that we discovered the rather fiddly 'press the TC button and then quickly press the track skip button' system that you have to use for DVD title access.

Otherwise and on the whole, though, the player's DVD performance was excellent.

Needless to say we also did a quick checkout of its performance as a CD player, as this will also be an important function for many buyers. Here again it performed very well indeed, with a measured frequency response within +0dB and -0.2dB between 20Hz and 15kHz, and less than 0.5dB at 5Hz and 20kHz. The noise level was below the noise floor of the equipment we were using, but certainly corresponded to a S/N ratio of better than 86dB.

On listening tests with our reference discs it also gave an excellent account of itself, so we have no reservations in endorsing the DVD 725 as a very high quality CD player — quite apart from its DVD capabilities.

In short, then, the Philips DVD 725 seems a very good performer and an excellent example of a 'better value for money' second generation DVD/CD player. Well worth considering, at the quoted RRP. ❖

Philips DVD 725

A compact and 'affordable' second-generation DVD movie and CD player.

***Good Points**: Resume function, flexible display formats, S-Video and optical/coaxial bitstream audio outputs, able to play CD-R audio and video discs as well as pressed DVDs and audio CDs.*

***Weak Points**: Remote control a little fiddly, and it's a pity there's no inbuilt Dolby Digital 5.1-channel decoder.*

***RRP**: $1095*

***Available**: Many AV dealers. For more information call Philips Electronics on 1300 36 3391, or visit its website at **www.philips.com.au**.*

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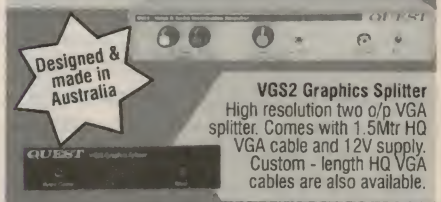

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Sony's DVP-S525D

Never a firm to rest on its laurels, Sony has made sure its DVD players have kept up with both technical advancements and market expectations. Its new 'next generation' DVP-S525D is an excellent example, offering excellent performance plus features like built-in 5.1 channel Dolby Digital/MPEG2 surround decoding and component video outputs — at a very competitive price.

BY JIM ROWE

IN JULY LAST year, when reviewer Louis Challis evaluated Sony's DVP-S715 'second generation' DVD player for *EA*'s readers, he found it quite outstanding — whether playing DVD movie discs or standard audio CDs. Even at that stage, Sony's DVD players had clearly achieved and were maintaining a market-leading position. But the tradition of achievement begun by co-founder Akio Morita lives on strongly, and probably before that review was even written, Sony engineers would have been working on the 'next generation' models — designed to provide even better performance and more features.

Well, here we are just over a year on, and those 'next generation' models have now been released. I've just been able to try out the new DVP-S525D, and having done so I'm certainly in no doubt that Sony is still maintaining its market-leading position. The new player seems to be at least as good as the DVP-S715 in terms of performance, while offering significantly more functionality — and at a price that's also significantly lower. How's *that* for not resting on their laurels?

But I'm jumping the gun a bit; let's start at the beginning. The DVP-S525D is a compact, attractively styled unit, like Sony's earlier models in an essentially black case but now with chamfers along both top and bottom edges of the front panel, to soften its lines. It's actually the 'economy' model in the new Sony range, with two other models having higher prices and specs: the DVP-S725D and the DVP-S7700 'reference' player.

In addition to the basic front-panel controls as provided on the earlier models, there's now a bright blue indicator to indicate multi-channel sound operation, and a larger range of icons indicating the various surround-sound formats that the player can deal with, in one way or another.

Needless to say, surround sound functionality is one area where the DVP-S525D really shines compared with the earlier models. First of all, it includes a built-in full 5.1 channel decoder for both Dolby Digital (AC-3) and MPEG2 surround sound — with the six line-level analog outputs on the rear panel, ready to feed into external amplifiers of your choice. Thus in one fell swoop, it caters for the digital multi-channel tracks found on the great majority of current DVD movie discs; these can be fully decoded without further ado...

...component video outputs are another very significant enhancement, and one that's still not very common even in other 'next generation' DVD players.

What about DTS, that alternative multi-channel format now available on a small number of discs? Well, like just about all other current DVD players it *doesn't* include an inbuilt decoder for DTS; but like many of the newer models, it at least identifies DTS tracks and delivers them via the bitstream outputs (both coaxial and optical), so you have the option of driving an external decoder.

Of course you aren't forced to use the player's inbuilt Dolby Digital/MPEG2 decoders, either. When you're playing discs with these tracks, their multi-channel sound information can easily be made available via the bitstream outputs as well, for using a fancier external decoder if you prefer.

In addition, the DVP-S525D also incorporates Sony's proprietary Digital Cinema Sound (DCS) system, which gives you a range of 'further options' when it comes to *virtual* surround sound modes. DCS seems to be a powerful DSP facility which is capable of not only synthesising 'virtual' multi-channel surround sound from standard stereo tracks (as found on many DVDs of older movies), but also creating satisfying multi-dimensional sound fields via a smaller number of amplifier/speaker channels than the full six.

Of course many of the newer DVD players do give you Virtual Dolby, to achieve a satisfying virtual sound field from two speakers; and many of the new AV receivers and amplifiers also give you Dolby Pro-Logic plus various 'DSP sound field' modes, to synthesise surround sound fields from Pro-Logic and stereo sound tracks. But the DVP-S525D essentially goes one further, by giving you *both* Dolby Pro-Logic and the equivalent of Virtual Dolby, enhanced with its own range of DSP modes — pretty unusual, especially as this is built into the DVD player itself.

Among the additional DCS modes available there are two Virtual Enhanced Surround (VES) modes, which recreate the full surround sound field using only the front speakers (like Virtual Dolby); and Enhanced Surround mode, which enhances the essentially mono surround information on Pro-Logic tracks to give a 'virtual stereo surround' effect via two rear speakers.

So quite apart from the inbuilt decoding for AC-3 and MPEG2 digital surround, the DVP-S525D offers quite a lot of flexibility for 'making the most' of stereo and analog surround sound tracks.

By the way, it provides a full on-screen configuration/setup facility, to simplify virtually every aspect of player and system configuration and setup — including how many speakers you're using, their sizes, their distances from the main listening position and so on.

Turning now to the video side, as you'd expect the DVP-S525D provides both S-Video and composite video (CV) outputs, as with earlier Sony players. In fact it provides two sets of each, with accompanying mix-down stereo analog audio outputs, so you can easily select between the two (for a second TV in another room, etc.) But in addition you now also get a set of *component video* outputs: Y, Cb/R-Y and Cr/B-Y.

So if your TV, video monitor or projector can accept component video, you'll be able to display the DVD video with even better resolution and clarity than with the S-Video outputs. This is another very significant enhancement, and one that's still not very common even in other 'next generation' players.

Needless to say the DVP-S525D also comes with a multi-function remote control, capable of being used to control a range of TVs and AV receivers/amplifiers as well as the player itself. The remote is pre-programmed with codes for quite a few brands and models in addition to Sony, too.

Oh, there's one more feature of the DVP-S525D that isn't immediately apparent: a new streamlined 'Precision Drive' system, using a high speed stepping motor and dynamic focus optical pickup. This is claimed to give faster, quieter and more reliable operation from the basic player mechanism, compared with earlier player generations.

Of course the DVP-S525D can play standard audio and video CDs as well as DVD video discs — but alas not CD-R or CD-RW discs, according to the manual. That's presumably because like many DVD players, it uses a single pickup laser.

Sony DVP-S525D DVD/CD Player

A compact 'next generation' DVD player, combining a nice range of features with a low-end price tag.
***Good points**: Built-in Dolby Digital and MPEG2 5.1-channel surround decoders; component video output; very flexible virtual surround sound decoding; excellent sound and image quality.*
***Weak points**: Very little. If it played CD-R discs as well, it would be beyond reproach!*
***RRP**: $1099.*
***Available**: Sony dealers, many larger department stores and discount chains. For more information call Sony's Consumer Infoline on (02) 9878 1777, or visit their website on **www.sony.com.au**.*

What we found

Thanks to Sony Australia we were able to try out a sample DVP-S525D player for a couple of weeks, to put it through its paces on your behalf.

First of all we ran the instruments over it, to check its performance as a CD player. As with earlier models the results were very impressive indeed. Signal to noise ratio measured very close to the quoted 110dB, while the frequency response measured was well within the quoted 2Hz - 20kHz +/-0.5dB; in fact both channels were within +0.05dB and -0.15dB, between 20Hz and 20kHz — about as close to 'ruler flat' as you could expect to get (or care about).

Currently we're not in a position to measure 'fade to noise' linearity or distortion accurately below the -60dB level, but cer-

The connectors at the back (from the left): optical and coaxial bitstream audio outputs, analog mixdown and composite video outputs, S-Video outputs, component video outputs and finally the six decoded Dolby Digital or MPEG2 audio outputs. Whew!

tainly down to that level the performance was again excellent in both respects. So all the indications are, from these quick measurements, that the DVP-S525D has all of the basic performance requirements for a top quality CD player.

This impression was in fact confirmed by our first listening tests, which were made using a Pioneer VSX-D906S AV Receiver driving a Jamo Apollo multi-channel speaker system. The sound produced from our reference CDs was particularly clean and 'transparent', and produced no auditory fatigue even after a couple of hours of concentrated listening.

After that we were able to view a number of DVD movie discs, including *Amadeus*, *A Few Good Men*, *In the Line of Fire* and *Blazing Saddles* — plus excepts from some others, including the ABCTV disc *La Boheme* (MPEG2 sound) and the Video Essentials DVDI 0711 system evaluation disc. Overall we were most impressed with both the image and sound quality from the DVP-S525D with all of this software, and our impression is that the performance of both the inbuilt 10-bit video decoder/DAC and 5.1-channel surround sound decoders with their 24-bit DACs are pretty well as good as anything you'll find in the latest generation of players.

Summarising then, the DVP-S525D may be the 'economy' model in Sony's new range, but it strikes us as a really outstanding example of the 'next generation' of DVD players. It's capable of delivering both sound and image quality that are very close to the limits of the software you're playing. When you remember that it's providing extras like built-in Dolby Digital and MPEG2 surround decoders, and component video outputs as well, that makes it very hard to beat — especially at the RRP of only $1099. ❖

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Cat. 11295	Ethernet Hub & LAN Card 5 Port UTP 10Mb	$109

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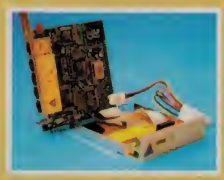

Mounts on the back plane of a computer but does not plug into a slot, it only connects to the power supply. No separate case & power supply means reduced costs, plus everything is kept neat & tidy inside the computer.

Cat. 11294	Ethernet Hub Card 5 Port UTP 100Mbps	$259
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Cat. 11297	100 BaseTX Ethernet Hub 4 Port	$189
Cat. 11281	100 BaseTX Ethernet Hub 8 Port	$539
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Cat. 11516	Enhanced Network Cable Tester	$129.

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Cat. 3359	Year 2000 BIOS Card	$129

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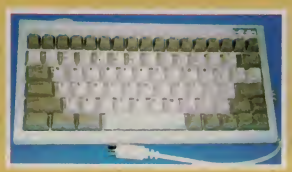
A dual bus diagnostic card! Simply invert the card to test the other bus. It identifies POST BIOS faultcodes & displays error codes. Diagnostic error codes are provided for AMI, AWARD & Phoenix BIOS. Suitable for 486 / 586 / 686 / Pentium II compatible systems.

Cat. No. 3362	Diagnostic card for PCI / ISA	$249
Cat. No. 3128	Diagnostic Card for ISA	$69

Compact Keyboard



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Cat. 8403	Compact 80 Key PS/2	$73

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Entering the Era of Virtual Acoustic Spaces - 1

The world's largest and most sophisticated permanent virtual acoustic system uses loudspeakers by Adelaide manufacturer VAF Research and amplifiers by Australian Monitor. How could this be? For more information, read on!

BY JOHN MATHESON

THROUGH THE 80's and 90's, there has been an unprecedented advancement of computer and digital signal processing (DSP) technology. Spawned by the introduction of personal computers and the compact disc, the electronic tools now exist to recreate the quality of real acoustical spaces — to create 'virtual rooms', if you like.

On a small scale, DSP has been used to create concert hall or ambience effects for home stereo and theatre systems and even ICE (In Car Entertainment) systems. Every recording and broadcast studio, performing arts theatre and rock and roll venue uses digital reverberation and effects generating devices to add echo, ambience, reverberation or other effects to sounds.

Now large-scale electronic architecture systems are being installed in public venues such as drama playhouses, opera houses and concert halls, both as remedial acoustical treatment for existing under-performing venues and in new multi-purpose venues designed to allow for variable acoustics.

Acoustical engineers traditionally control the acoustics of spaces by adjusting the properties of boundary surfaces. To the extent that architects and interior designers will allow them, they control the size, angles, and reflective and absorptive properties of the walls and other surfaces in a space.

Electronic architecture does not eliminate the need for good architectural acoustical design, but its application is very flexible and it can be used to overcome some of the physical limitations of traditional architectural acoustics.

Differing needs

The desirable acoustical behaviour of a perfor-

mance space depends very much upon the type of performance presented in that space. For example, there are fundamentally different acoustic requirements for speech, amplified performances, opera and orchestral concerts.

The spoken word needs strong early frontal reflections to give adequate strength (i.e., loudness) to be heard, an absence of echoes and a short reverberation time to prevent loss of articulation. Similarly, amplified performances need a freedom from echoes and a short reverberation time.

Symphony orchestra concerts need a longer reverberation time to blend the sounds from each part of the orchestra, with strong lateral, rather than frontal, reflections to create a sense of envelopment and spaciousness. Because early composers were constrained by the performance spaces available to them, they wrote music to sound good in those spaces. Thus music from the Baroque period is best performed in small auditoria, Classical music in a larger space, and Late Romantic music in very large auditoria.

Opera, like speech, needs strong early frontal reflections for the voices to be audible, but also needs the auditorium to blend orchestral sound from the pit harmoniously without overpowering the singers. The reverberation time required for opera is a compromise between orchestra (long) and speech (short). Concert hall reverberation would impair articulation of the human voice in an opera performance.

Electronic architecture?

Two-channel stereophonic records were introduced in 1954 in an attempt to preserve the spatial aspects of the recording environment. Later quadraphonic, ambiosonic and holophonic recording systems were developed to preserve more of the original recording environment's acoustical character, though none of these systems found consumer commercial success. Dolby Surround and more recently Dolby Digital on video sound tracks have ushered in the next generation of multi-channel stereophonic sound reproduction for consumers.

These various sound reproduction systems use typically between three and eight channels, and use or simulate a number of spatially placed microphones to record signals for replay on a similar array of loudspeakers in the listening room. Some systems incorporate HRTF's (Head Related Transfer Functions) and/or inter-channel crosstalk cancellation schemes to improve performance in real rooms.

In contrast, electronic architecture is not a sound reproduction system like stereophony, but is the creation of acoustic fields to alter the acoustic behaviour of a space. The aim of electronic architecture is to provide improved acoustics in existing venues and variable or virtual acoustics in general. These systems work by electronically placing virtual reflecting surfaces in desirable positions, and by electronically removing excess sound absorption.

Electronic architecture has nothing in common with stereophony or, for that matter, public address systems, other than it is achieved through the use of sound equipment — that is microphones, signal processing, amplifiers and loudspeakers. In contrast to conventional sound reproduction systems, sound systems for electronic architecture are generally characterised by having a small number of microphones and a loudspeaker array with a very large number of loudspeakers, which 'tile' the walls and ceiling of a space.

These systems have some very stringent requirements that set them apart from conventional public address design approaches. In the first instance, electronic architecture is generally used to 'amplify' the acoustical space (rather than the performers), in the same way walls and reflectors would be used if the acoustical engineer had the freedom to place them where they are needed. The resulting musical balance is not determined by a sound engineer, but left firmly in the hands of the conductor or musical director.

Secondly, the power response of the system (the sum of acoustical energy at all frequencies) must be very uniform. Since acoustical energy from the system is recirculated back through its own microphones, any deviation from a flat power response will be quickly evidenced as colouration in the decaying sound field in the room. This is a most stringent requirement for the design of the loudspeakers, which must have a near uniform power response.

In contrast, public address and hifi loudspeaker systems generally have non-uniform power responses as a consequence of their multi-driver design. Krix Loudspeakers and VAF Research have developed two new loudspeakers suitable for electronic architecture right here in Adelaide. These loudspeakers are now being used in installations in the USA. (See the box on VAF Research for more information about the development of these ultra-quality loudspeakers).

Thirdly, an electro-acoustic system for electronic architecture must have some means of simulating early reflections and reverberation to add to the signals fed back into the room via loudspeakers. High quality, digital reverberation processors are readily available for the professional audio industry, but simulators for electronic architecture must allow control of specific parameters not normally available in studio and sound reinforcement devices.

Finally it is critically important that the locations of individual sources of acoustical energy (other than the performers!) are not apparent to the listener. A great deal of care

VAF Research

Adelaide-based VAF are well known for their ultra-quality kit built speaker systems. In fact, VAF are the largest Australian producer of high quality speakers for the specialist audiophile market in Australia.

A long involvement with third-party OEM manufacture has given VAF an unparalleled research and development base. Scientific methodology is applied to verifying the accuracy of all of VAF's products, even the least expensive. Who else publishes cumulative decay spectra data for all of their loudspeakers? For that matter, who else manufactures a range of loudspeakers with such low stored energy at any price?

When VAF were invited to design a loudspeaker to the stringent power response requirements for electronic architecture, they first measured existing designs against the required specification. They came close, but were not quite there. Fortunately, VAF were already completing the process of developing a new technologically advanced tweeter, which fitted the bill exactly. The new loudspeaker was prototyped, air freighted to LARES in Boston, USA, where it was tested and accepted — all within the space of six weeks!

The challenge of producing a loudspeaker with such an extraordinary power response (the power response is the sum of frequency responses in all directions) has given VAF new insights into loudspeaker technology and understanding the mechanisms at work in sound reproduction. Future VAF products will benefit from improved power response, particularly important for home theatre applications and natural sound reproduction.

Innovation is nothing new to VAF, who developed the remarkable DC-X loudspeaker with physical filtering as featured in the January 1997 issue of Electronics Australia. *The DC-X is still unmatched in its sensitivity, quality and performance, even by loudspeakers costing many times as much. Of course this is helped by their innovative direct sales approach, which means no wholesale and retail price mark-ups.*

See VAF's full product range with all specifications and technical data at ***www.vaf.com.au***.

The author pictured holding one of the VAF Research loudspeakers, in front of the racks of Australian Monitor amplifiers.

in the system design is required to ensure that individual loudspeakers do not become 'unmasked' under any circumstances.

This last requirement means that no adjacent speakers in the field of a listener can have the same signal. If they do, the human ear will sum the energy of both or all loudspeakers and attribute it to the nearest one, thus potentially unmasking the source. (This localisation is caused by a psycho-acoustical phenomenon known as the Haas Effect.)

The development of electronic architecture started in the 1930s with experiments conducted by RCA at the Philadelphia Academy of Music, where stairwells adjoining the auditorium were excited by loudspeakers to increase the reverberant energy level in the hall. In 1955 the first Philips Ambiophonics system was installed in the La Scala Opera House in Milan, Italy.

This was followed by the AR (Assisted Resonance) system installed into the Royal Festival Hall, London, then came MCR (Multi Channel Reverberation), ERES (Early reflected Energy System), RODS (Reverberation On Demand) and ACS (Acoustic Control System).

Several companies are currently marketing electronic architecture systems using modern DSP techniques, including SIAP (System for Improved Acoustic Performance), LARES (Lexicon Acoustic Reinforcement & Enhancement System) and Yamaha's AFC (Acoustic Field Control).

How does it work?

Acoustic signals for an electronic architecture system are collected by a small number of microphones placed in the far (reverberant) field above the performance area and audience. Only a small number of high quality condenser microphones will be required to cover the whole performance and audience area from this distance.

As any sound engineer will know, it is very difficult to get adequate gain before feedback in a reverberant space, even with close microphone placements. An electronic architecture system needs some technical means of achieving a substantial increase in loop gain capability (i.e., the amount of amplification possible before feedback), so that the system will operate with stability and without colouration.

The heart of an electronic architecture system is its *signal processing*. The available loop gain of an amplification system in a room is a function of the number of open microphones. For every doubling of open microphones, the available loop gain is halved. However, if the relationship between each microphone and each speaker can be *decorrelated*, then each doubling of independent signal chains increases the loop gain available by 6dB.

Typically an electronic architecture system will have between four and six microphones, with between 8 and 64 decorrelated transfer functions, allowing for 6-12dB of additional loop gain over a single microphone-loudspeaker amplification chain. In practice, this leaves sufficient stability margin for a natural sounding system, because the total system gain required is typically less than 3dB.

Positional information about the sound source(s) and its directivity is captured by the amplitude and time relationships between the different microphone signals.

Australian Monitor amplifiers

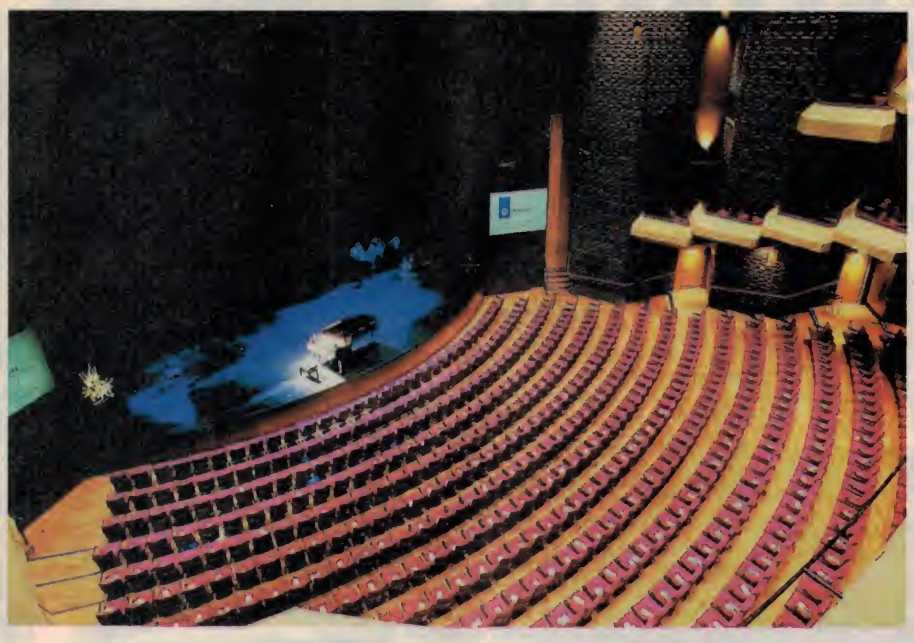
Manufactured in Ermington, a suburb of Sydney, Australian Monitor amplifiers are meticulously built using the highest quality components available. The company continually updates its products — equally suited for sound reinforcement or studio applications — to maintain the sonic purity and durability for which they have earned a solid reputation.

In a complex sound system driving hundreds of loudspeakers, one of the difficulties is the ability to quickly diagnose and locate a fault. Even just being able to reassure the operator that everything is OK is a valuable tool. Recently Australian Monitor developed an internal interface to the Crestron computer control system used in many large audio-visual installations. The catalyst for this development was the LARES electro-acoustic system installed in the Adelaide Festival Theatre, which will be discussed in the second of these articles.

The amplifiers use an on-board microprocessor to monitor various operating conditions for each channel. Quiescent supply voltages for pre-amps, drivers and outputs are continuously monitored. An input-output comparator checks for faults such as out of spec gain, excessive noise, distortion or clipping. Load current sensing alerts the operator to a faulty loudspeaker or open circuit cable.

The microprocessor is used both to minimise false reports and to make intelligent decisions, such as shutting down a channel in a fault condition. For example, should a supply fault be detected the output load is instantly disconnected so as to protect the loudspeakers from DC, and a fault condition is reported to the operator via the computer network. Each amplifier reports its condition as 'Ready/OK', and fan speed, thermal condition, and service indicator are also provided. The channels have individual input mutes and output relay disconnects, as well as remote power control, and plug directly into the Cresnet data network.

The Adelaide Festival Theatre LARES system was Australian Monitors' most ambitious design and build project to date, where design and development, procurement, fabrication, building 51 units from scratch and delivery was completed in less than eight weeks! More information on the company can be found at ***http://www.netaxs.com/~neverltd/Ausmon.html***.



The Adelaide Festival Theatre auditorium, where 287 VAF Research loudspeakers and 51 Australian Monitor four channel amplifiers have been installed in the world's most sophisticated electronic architecture system.

This information must be preserved by the subsequent signal processing system, which generates the many different patterns of early reflections and reverberation required for each loudspeaker position.

The signal processing also provides system equalisation to preserve an overall uniform energy transfer function, and time delays as required. Ideally, there would be one signal processing chain for each loudspeaker, but in practice it is possible to achieve some economies in the design without compromising acoustical quality.

If we intend to use electronic architecture to create a suitable space for traditional types of performances, we need to have loudspeakers positioned where the sound would arrive from in an ideal space for these performances. Essentially this means that only the floor will not need to be covered!

The density of the loudspeaker array is dictated by one of two factors. Where the distance to the listeners is great, such as the upper proscenium of a stage and front ceiling area, there must be sufficient loudspeakers to deliver the total acoustical power required. There must not be any compression, either caused by short-term cone displacement limits or long term voice coil thermal gain (which affects loudspeaker efficiency).

Where the loudspeakers are positioned relatively near to listeners, such as low on side walls or overhead in balcony overhangs, the number of loudspeakers required is determined by the need for a uniform power response from the array for each listener.

Typically four times as many speakers will be needed than for a distributed public address system at the same ceiling height. An electronic architecture acoustical system will likely require one loudspeaker for each five to twenty audience members, depending on the complexity of the acoustical space.

"You won't get this sound on your home entertainment system", said Deborah Jones in *The Australian*; similarly Barry Millington wrote in *The Times* (London): "London's Concert Halls should investigate immediately". They were both referring to the world's largest and most sophisticated LARES installation, in the Adelaide Festival Theatre. We'll look at this very interesting and timely example of electronic architecture in the second of these articles, in next month's *Electronics Australia*. ❖

The Author

John Matheson is employed as a Electro-Acoustic Designer by Bassett Acoustics, an independent firm of consulting engineers. He provides specialist sound system design of public address systems, theatre and cinema sound systems, electronic architecture, nightclub sound systems, background music systems, talkback & intercom systems and assisted listening systems.

Before joining Bassett Acoustics, John worked for many years at the Adelaide Festival Theatre where he held the positions of Theatre Logistics Manager and Technical Manager - Sound. He was closely involved with the design and development of the highly acclaimed LARES acoustic enhancement system installed into the Festival Theatre.

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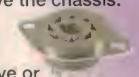
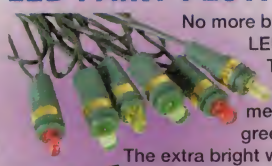


8 Pin: Made from similar materials to above, but with moulded key. Can be mounted above or below the chassis. Cat. PS-2080 **$4.95**

LED FAIRY FESTIVE LIGHTS



No more burnt out globes! These LED fairy lights look great. The harness is 20m long with 120 lamps, 6 to a metre. The LEDs are red, green and yellow in colour. The extra bright water clear LEDs are ideal for festoon or tree decorating. An approved plug pack mains transformer is also supplied. Cat. SL-2840 **$39.95**

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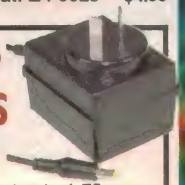

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See 1998 Catalogue page 200 for full details. Cat. QC-3465

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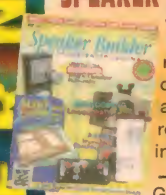

Jaycar are now distributing 2 audio magazines from USA. Speaker Builder is released 8 times per year, and is the worlds only magazine in English dealing exclusively with the art and craft of speaker design. Ideal reading for professionals & those simply interested in speakers. Cat BA-5036 **$12.95**

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NEW DMMs

See 1999 catalogue page 27 for details

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TEMPERATURE DMM C

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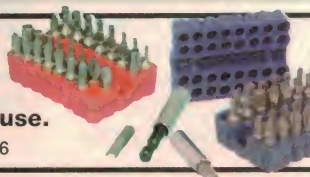

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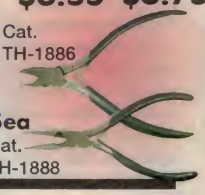

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Cat. TH-1888

GAS TORCH

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CCD 4 Way Camera Switcher

This automatic switchbox accepts up to four video inputs from CCD/CMOS cameras on up to two video monitors. Using 2 monitors any combination of the four cameras can be scanned & displayed on either monitor. Audio channels are provided. See 99 Cat. page 220 for full details. Cat. QC-3480. **$189.50**

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This home security system comes complete with everything you will need. It has a PIR detector, three magnetic switches for doors and windows, an external siren, AC power supply plus hardware. Extra PIR and magnetic switches can be added if required. See 1999 catalogue page 84 for full details. Cat. LA-5410
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3) BNC socket input - can be panel mounted output RJ12 pins 4, 5 or screw terminals Cat. QC-3427

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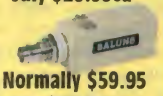
July $29.95ea



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Red	3000	20mA	1.8V	ZD-1796	95c	$0.80	$0.65
Green	80	20mA	2.0V	ZD-1794	50c	$0.40	$0.30
Yellow	160	30mA	2.1V	ZD-1795	50c	$0.40	$0.30
Red	6500	20mA	2.0V	ZD-1777	$1.95	$1.50	$1.00
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NEW

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$99

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NEW

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NEW

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*NS-3005 0.71mm 200 grams solder

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Quote from Car Stereo Australia Magazine No 10 (After testing our CS-2228 12" Subwoofer)

"The Jaycar speaker surprised me a lot. Looking at its beefy business like construction, I expected it to sound big, brash and brassy. Instead it offered the smoothest most linear sound of the group. Even at low volume this sub still exhibited excellent warmth, weight and authority (exceeding many of the 15"s I've reviewed) but when fed lots of power the Jaycar speaker didn't lose any of its tonal accuracy or control, sounding just as balanced with the rest of the system as it did at low volume. **Overall performance was exceptional."**

NEW

10" SUBWOOFER Cat. CS-2226 **Only $299**

12" SUBWOOFER Cat. CS-2228 **Only $329**

Only $89

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Amazing Amplifier Bargain!

NEW

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ONLY $5 EA

Power supply to suit cat MP-3055 $24.95 (see page one)

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NEW CCD CAMERAS

SEE 99 CAT. PAGE 219 FOR DETAILS

Board Camera with Audio Cat. QC-3462

$119

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Pinhole in Case with Audio Cat. QC-3475

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Was $44.95

August $39.95 Save $5

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This key fob transmitter will learn the code of your transmitter. Brand name replacements are very expensive, & sometimes impossible to get. This will solve your problem. It can actually learn up to 4 different frequencies, so it can be programmed for the car alarm, the garage door, home alarm etc, etc. Supplied with full instructions. Not suitable for code hopping alarms. Cat. LA-8990

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Plastic Blow Case

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BY STEWART FIST

The media and the ESAA study

EVEN WITH university tenure, many scientists have vested interests in keeping companies on-side — especially when governments reduce university funding and virtually opt out of all scientific research relating to industrial developments.

Fortunately, in Australia and most of Europe, we still have a tradition of governments funding for independent research to examine the safety of potentially harmful products and check the efficacy of new drugs. But in America, the companies themselves must fund this research. They do this because consumer-protection is left to the legal system, where massive damages are awarded to people who are injured and the relatives of those who are killed. Frankly, I find this 'post hoc' approach quite appalling.

Australia has a reputation now in EMF research, which rests on parallel studies into GSM phone exposure and power-line magnetic fields done in Adelaide, using transgenic mice.

Australian scientists also have the world record for publishing scientific reports. Per capita, we produce roughly 10 times as many research papers as other major developed countries — which is not necessarily an indication of quality.

More papers, produced by less funding, is I suppose, a measure of productivity as defined by economists. On a per-capita basis, Australian governments only fund biomedical research to $US6 a year while the USA spends $US54, nearly 10 times as much.

The problem, as I see it, is not so much in the quality of the research being conducted here, but in the fact that increasingly pressures are coming on Australian scientists to publish *anything*, to maintain funding. In the process, they need to slant the public-exposure of their work (as distinct from the scientific research reports) in a way that keeps sponsors and potential funders happy.

It is often very difficult to figure out whether the journalists have misunderstood, or whether the information has been deliberately or inadvertently been given a slant by the scientists themselves. It might also be filtered through research institutions, or twisted by the funders, or given a 'spin' by public relations companies employed by the company concerned.

It is worth checking out the way the Royal Adelaide Hospital transgenic mouse research was handled. You may remember that I wrote about the GSM-cellphone research conducted here in the second column in this series, and I mentioned that there was also a parallel research project exposing the same mice to five levels of magnetic fields using mains power.

In my opinion, the only conclusion that anyone can legitimately reach is that the kidney disease link is worrying, and the study needs to be repeated urgently

The scientists themselves played down the significance of the GSM results, even though other scientists now claim it to have been one of the most important findings yet. It established, almost beyond doubt, that RF can promote tumours.

So this presents us with an interesting case study into how scientific results are presented. It involves two separate but almost identical projects; the studies were run simultaneously by the same group of researchers in the same animal facilities, and both were conducted between August 1993 and February 1995.

Both results were due to be published in April 1995. However, after a two-year delay, the GSM cellphone results were only released at the end of April 1997. The Adelaide press conference told a few invited cadet journalists that mice-studies weren't really relevant to human health — which must have surprised the thousands of medical researchers around the world who conduct mice studies every day.

The ESAA's electricity power study took another year to be released, but they made up for the delay by promoting a press-conference in Sydney with television and radio invited. They even circulated a University of Sydney press release suggesting that power-lines had been proved safe.

De-spinning the facts

Let's look at the facts. The ESAA study used 528 transgenic mice overall, and these were divided into five exposure groups of just over 100 each. One was the control group which received only 'sham' (pretend) exposures, and the others were exposed to magnetic fields of 1, 100, 500 (switched) and 1000 microTeslas.

Actually this wasn't normal mains power, because they carefully filtered it to remove the normal 'transients' — leaving pure 50Hz sine waves.

With this family of mice the spontaneous rate for lymphoma is about 15%, and the highest rate found in the experiment (30.5%) was with the most highly exposed group. This would normally be considered highly significant, but there were complications.

They also had an unexpected high rate of lymphoma in the sham-exposed control group (28.8%), which was further confused by an epidemic of kidney disease. This also hit the exposed groups much harder than the

unexposed, and made cancer-promotion interpretations virtually impossible.

Their levels of kidney disease were:

1. the most highly exposed group had 20 cases or 19.2%
2. the second highest had 16 cases or 15.2%
3. the third highest had 12 cases or 11.6%
4. the fourth highest had 9 cases or 8.5%
5. the unexposed group had 10 cases or 9%.

Scientists normally assume that such a dose-related link between exposure and disease is fairly important, and the report admits that this finding is statistically significant. However, since it was outside the parameters of the research design (which was to look at *cancer* incidence) it appears to have been ignored.

Perhaps they did a follow-up study in the three-year delay before announcing the results. But if so, they didn't tell anyone, or make any public announcement about the results.

One valid assumption here could be that the EMF exposure was effecting immune responses in general. This could explain the higher lymphoma rate and the much higher kidney-disease rate in the exposed animals.

In my opinion, the only conclusion that anyone can legitimately reach is that the kidney disease link is worrying, and the study needs to be repeated urgently. Since a lot of the international epidemiological research points to low level cancer-promotion by mains-power fields (at high ambient levels), I'd have assumed that such repeated research was essential, given these findings.

When the ESAA findings were finally made public at a Sydney press conference on March 2, 1998, they were accompanied by a simple press release from Sydney University's Centenary Institute headed:

No Evidence for Cancer Link with Powerlines.

No increase in incidence of a cancer of the immune system called lymphoma was detected in mice after prolonged exposure to magnetic fields of the type emitted by electric power lines and equipment.

This statement is strictly true, but it avoids mention of the confusion caused by kidney disease. And, when a report is promoted in this way as a positive finding, the press and the public assume that the headline actually means 'Evidence Proves Powerlines are Safe'.

This is the spin.

The *Sydney Morning Herald* reported the result this way:

"In view of the earlier reports of a possible association between proximity to powerlines and incidence of childhood leukemia, a close relative of lymphoma, our clear cut negative results should be very reassuring," said Professor Basten, [it] "supports other carefully conducted studies showing no measurable increase in cancer risk and really should be of great peace of mind to the many thousands of people who live near or under powerlines."

I don't find much peace of mind from a study like this, at all.

Rather predictably, the ESAA also issued a press release headed 'Australian study reveals no evidence for EMF cancer link', which says: *The result is reassuring because the mice used in the study were particularly sensitive to showing subtle changes of any magnetic field effects.*

This is a total distortion — there is no known link between magnetic fields and lymphoma, and the transgenic mice have never shown any 'particular sensitivity' to any such changes, let alone 'subtle' ones.

They also stated: *the magnetic field levels used in the laboratory were much greater than those experienced by people in daily life.* In fact, the lowest were probably at about the exposure levels we get from home appliances; those in the middle were at electric blanket levels; and the highest were at some occupational levels.

Professor Basten recorded three TV news interviews that night, and each news bulletin led with the claim that power-lines had been cleared from any suggestion that they could cause cancer. There was no mention as to whether magnetic fields could cause kidney disease or suppress the immune system. ❖

Canon's FC220 Personal Copier

How good *are* those small personal photocopiers now available at below-$800 prices from office supply stores? How do they compare with a modern full-size office copier, in terms of both performance and capabilities? We decided to find out, by looking at one of Canon's new babies.

BY JIM ROWE

MOST PEOPLE WHO work in an office environment regard a photocopier as an almost essential resource, nowadays. I know they *certainly* are, in a busy magazine editorial office! And when you have such a valuable tool 'at work', it's surprising how much you miss this convenience at home...

The idea of having a copier at home is therefore quite attractive to many of us. But until a few years ago, there was a major hurdle as far as most of us were concerned. Although the photocopier makers had perceived a potential market and begun to provide small 'personal' models to address it, they were generally still too pricey for most of us — either in terms of initial cost, or running costs (i.e., expendables), or both.

Then a few more attractively priced units did start to appear, but they seemed to have other problems. Some seemed to produce rather inferior copies; others soon gained a reputation for poor reliability.

Of course this area of imaging technology has been undergoing rapid developments in the last few years, perhaps partly because of its overlap with laser printing technology. Indeed, combination laser printer/scanner/photocopiers have started to appear, and at surprisingly attractive prices. So one way or another, it would be surprising if traditional copier makers couldn't now produce a high quality 'personal' model, and market it at a good price...

Like me, you've probably mused along these lines, and even looked at a few of the personal copier models in office supply stores. But what are these current models actually capable of doing, and are they good value for money? When Canon offered one of its new FC220 'personal/portable' models for review, I decided to try and find out.

The main limitation of the FC220 compared with its larger brothers seems to be the lack of enlargement/reduction copying...

The FC220 is a fairly compact little unit, measuring 402 x 359 x 104mm in folded-up form and weighing about 8.2kg with the toner cartridge fitted. When the paper trays are unfolded on each end for copying, it needs a desk footprint of 816 x 405mm.

Like many of the lowest-level copiers, it's based on the moving-platen principle. During copying, the glass platen and your original move past a fixed scanner bar, while the sheet which becomes the copy moves through the machine in the reverse direction. It looks a little crude compared with a modern fixed-platen office copier, but I imagine it simplifies both the optics and the mechanics inside the copier itself. Hopefully this translates into lower cost combined with higher reliability.

But apart from the slightly dinky appearance, are there any real disadvanges of the moving platen? Well, mainly in terms of the size and kind of originals you can copy. In their specs for the FC220 Canon says that it will cope with original sheets up to A4, books and 3D objects up to 2kg in weight. Which sounds pretty good, especially the prospect of being able to copy books. However since the platen is moving, you really can't hold the book down manually during copying, as you can with most fixed-platen office copiers.

So in this case your book has to be one which will lie open flat, without any manual assistance. Not much good for making copies from annual bound copies of magazines, for example, but it's generally fine for

making copies from saddle-stapled individual copies or comb-bound user manuals.

The other main drawback, though caused by the size of the platen rather than its dynamic nature, is that the copier will only copy up to A4 size. A bit limiting, to be sure, but probably still OK for a lot of 'personal' copying.

You can copy onto normal 80g/m² copying paper, or in fact any A4 or smaller paper of between 50 and 128g/m². It will also copy to laser-compatible transparencies, tracing paper, label sheets, coloured paper, postcards and card stock up to 128g/m². (You can also copy onto adhesive-backed thin plastic or metal film, of the type used for identification labels and prototype front panels. I tried it...)

As you'd hope and expect, the FC220 uses the standard charge-transfer-toner ('Xerographic') copying system, with an organic photoconductor (OPC) drum for producing and transferring the charge image. This is combined with a toner projection system and Canon's proprietary 'RAPID' fusing system, to produce high-resolution copies quickly and quietly.

But *how* fast? Quite fast, really. The FC220 has virtually no warmup time; you can simply turn it on, place your original on the platen, press the Copy button and away it goes. Your first copy is sitting in the out tray about 22 seconds later, with additional copies at the rate of four per minute. Compare that with typical office copiers, which can take quite a few minutes to warm up, and then may not be much faster per copy.

It's quite a speedy little baby, in other words, and the lack of warmup time means that you don't need to keep it on all day; just turn it on to make a few copies, then off again. That should save on power bills.

Its power consumption is specified as '600W maximum', by the way, but this is only during copying. Between copies it's naturally much lower. I measured the review unit at 32W when not copying, and about 450W when making a copy.

By the way, the FC220 not only doesn't mind you turning it off between copying sessions, but actually has an 'auto power off' feature built in: if you don't make a copy for five minutes, it turns itself off automatically.

The copying 'engine' in the unit is based on a replaceable toner cartridge, and the compact slide-in cartridge is similar to that in many modern laser printers. It's readily removed and replaced. There are two black-toner cartridges available, the E16 rated at approximately 1600 typical 6%-coverage A4 copies, and the E32 at about 3100 similar copies. There are also 'E' coloured-toner cartridges (red, blue, green or brown), rated for about 1000 copies of the same coverage.

The E16 cartridges seem to have a typical street price of about $180, which seems a bit steep considering the modest initial cost of the copier itself. Still, it means that copies on standard 80g/m² A4 paper should work out at about 13c each, if you ignore the initial cost and count only the 'expendables'.

How about copying flexibility? Well, the FC220's paper input tray, described as 'multi-sheet feeding', will take a stack of paper 5mm high (about 50 sheets of standard 80g/m² paper, or a smaller number of thicker sheets or cards) — not as many as an office copier tray, but still quite handy. The machine itself can also be set to produce up to 10 copies of an original automatically, plus an 'F' mode where it will copy until the paper in the input tray is exhausted. In other words, any number of copies up to about 50. The input paper feeding guides can be set for paper down to about 80mm wide.

In terms of copy exposure/density, it provides an 'auto exposure' copying mode as well as manual adjustment via a small 1-9 rotary control. The overall density of copying can also be adjusted via a three-position 'calibration' slider switch (near the power switch), adjusted using a small coin or similar.

There's no enlargement or reduction copying; you're limited to 1:1 actual size. This sounds like a fairly serious limitation, but in reality a great deal of 'personal' copying is done at actual size anyway. How acceptable you'd find this limitation will depend on the amount of reduction/enlargement you need to do, of course.

Trying it out

OK then, how did we find it? Well, we had no trouble at all setting it up. You simply find a suitable area of desktop, place it down, unfold the paper trays, plug it in, place some paper in the multi-sheet feed tray, turn on the power and you're ready to go. The review unit already had the toner cartridge fitted, so we didn't even have to unpack it and slide it in place.

In copying we found the FC220 very quiet, smooth and reliable. Thanks to that zero warmup time it was also impressively fast, with no noticeable slowdown compared with a larger office copier. We have a fairly heavy-duty Canon NP6050 in the *EA* office, for example, and in terms of speed for single copies the little FC220 was quite comparable.

Copy quality was also very acceptable, too. We compared the quality of copies from a range of black/white, greyscale and coloured originals, using the default 'auto exposure' settings, and those from FC220 compared surprisingly well with copies from the NP6050. The greyscale resolution and colour-grey conversion ability was perhaps a little more limited, and the basic copy resolution not *quite* as good, but overall it was judged entirely satisfactory for most 'personal' copying.

The copy size accuracy was well within the specs of +/-1.2%, too.

So on the whole, and judged in terms of basic 'personal' copier use in a typical home office situation, the FC220 seems a nice little performer. The copying quality is very good, it's fast and quiet, and although the running cost seems a bit high considering the modest initial cost, it's still pretty reasonable.

The main limitation of the FC220 compared with its larger brothers seems to be the lack of enlargement/reduction copying. If you can live with that, it should be quite an appealing proposition; if you can't, be prepared to pay about double its cost for one that will. ❖

Canon FC220 Personal Copier

A compact, low cost moving-platen photocopier using readily replaceable toner cartridges.
***Good points**: Fast copying, quiet, good copy quality.*
***Bad points**: No enlargement or reduction copying; moving platen limits possibilities for the types of originals you can copy. Relatively high cost of replacement toner cartridges.*
***RRP**: $749.*
***Available**: Canon dealers, office supply stores. For details contact Canon Australia, 1 Thomas Holt Drive, North Ryde 2113.*

Forum

Conducted by Jim Rowe

More on DVDs and region coding, and a complaint about TV station logos...

There have been still more responses to my editorial comments earlier this year drawing attention to the region coding system that's been foisted on us by DVD software producers. I'm presenting some of them here, including one which suggests that the DVD player manufacturers may not be much happier with the region coding than we consumers.

YOU MIGHT RECALL that in the February, March and April issues, my editorials were about the new DVD video discs and the way their region coding system has inevitably slowed down the release of movie titles in 'also ran' regions like Region 4, which includes Australia and New Zealand. Not surprisingly the editorials produced quite a bit of response from readers — both critical and complimentary — and I published some of these in the June column.

Well, there have been still more responses since then, some of them bringing up aspects which we probably haven't focussed on enough as yet. So I thought we'd look at some of these this month, before moving on to other topics for a while.

To begin, here's one that arrived only a few days ago from New Zealand reader Mr John Penney:

I enjoy Electronics Australia and Forum so much I felt I must add my support to your editorials. You have such an inoffensive writing style I am always surprised when readers take you to task, but then I guess diversity of opinion is the fun part of Forum.

Here in rural NZ (Blenheim) I have a multizone Toshiba SD-K320 DVD player, for which I happily paid NZ$1499 including three titles. Our local video store is stocking a range of Region 1 discs for hire. With the change in the NZ laws in regard to parallel importing, I don't think any restraints could be imposed on sale or rental of Region 1 DVD's in NZ.

Something not yet mentioned are copy protection mechanisms — my Toshiba at least won't play successfully through our Mitsubishi HS-651V VCR; the film brightness varies from low to high over a 10-20 second period. Moving the cables around to route the video and sound through the Aiwa NSX-AVH9 sound system and thence to the TV removed the problem.

In considering the cost of the players, it is important to look at the other features too — especially inbuilt AC3 and DTS decoding. The Toshiba has both.

Non-multizone players seem to fall into three camps: those that cannot be modified or need an EPROM change, those that can be changed by adding a resistor or making a simple change on the board, and those that can be changed via the remote control. Your earlier Web references are a good source of this information. Personally I had no desire to purchase a new DVD player and then 'fiddle' with it, when multizone players are available.

Thanks for the opportunity to contribute.

And thank you for your comments, Mr Penney. Your point about the likelihood or otherwise of restraints against local sale or rental of Region 1 DVDs is an interesting one, too. I'm not sure about the situation over there, but there doesn't seem to be any serious restriction over here — at least in practice, anyway.

I suspect the software producers would like us to *believe* that Region 1 discs can't be legally sold or rented here; as you're probably well aware, some of the Region 1 discs even have a legal-looking statement on their package, proclaiming that they can only be sold legally in North America. But whether such restrictions can actually be enforced legally in other countries (like ours) is probably a different matter. In any case it's probably one of those restrictions that basically can't be enforced, in these days of international commerce via the Internet and Web.

Perhaps you're right about us not having talked enough about the copy protection systems built into DVDs. As you've obviously discovered the hard way, the Macrovision copy protection built into most discs (at least for the feature movie itself) means that you really can't feed the video into your TV via a VCR. It has to be fed in directly, because it's the AGC system in a VCR that is most affected by the Macrovision 'dancing pulses' and other nasties — and this happens even if you're simply trying to feed the video through the VCR, without any attempt at recording.

By the way, my impression is that the Macrovision is controlled by the actual DVD disc content, rather than the player (which simply 'follows orders'). For example I've tried playing a Region 1 disc where the feature itself was clearly protected by Macrovision (it played havoc when I fed it through an NTSC/PAL converter, to view it on an old PAL-only set), but the movie's 'trailer' on the same disc was just as clearly not protected...

I certainly agree that current DVD players seem to fall into the three broad groups you describe, in terms of their ability to be 'coaxed' into multi-zone operation. However I suspect that player manufacturers are being pressured more and more by the software producers to make it even harder for their 'next generation' models to be modified.

So before buying one of the latest players, and assuming you want the widest choice of software, it's probably going to be even more important than before to get a demo of it playing Region 1 software as well as that for Region 4 — and preferably some sort of written assurance that it will be able to play either type of software indefinitely, because some players seem to allow only a small number of 'personality changes' before fixing their region coding permanently...

Different slant

Leading on from that thought, it's becoming fairly clear that there's quite a lot of tension 'behind the scenes' between DVD player manufacturers and the software producers, over the complications and drawbacks of region coding. I imagine that this is because the player makers aren't dills — they realise that region coding is seriously slowing down the release of movie titles, and hence the sales of their players, in smaller markets like ours.

So despite their formal agreement with the coding system and compliance with it, they

often seem to be somewhat lukewarm about it in practice. And as for the retailers, they seem to be downright enthusiastic about modifying players pre-sale, or even advising customers about players that can be persuaded to play Region 1 discs via a few secret key presses. After all, a sale is a sale!

All of which leads me to the next reader response, which came from Mr Paul Proctor. As you can see Mr Proctor found an interesting website associated with a group of DVD player manufacturers, and received an interesting response when he sent them a complaint about there being not enough Region 4 titles as yet. But I'll let him explain:

Just something to add to the availability of DVD's in Australia.

I found a website at 'http://www.dvdvideogroup.com' which appears to be the DVD Manufacturers Forum web site. I emailed them from the 'Contact' page (getinfo@dvdvideogroup.com) and got the reply shown below.

It appears that this group needs complaints from angry users such as ourselves, to place pressure on the software providers to roll out titles to non-region-one areas faster. Perhaps you could publish the email address (getinfo@dvdvideogroup.com) and get aggrieved DVD users to email this forum, so they have the ammunition to force faster rollout of titles in Australia.

I have also replied personally to the email and pointed out that as the manufacturers of the players were sick of waiting for the titles to be released in Australia they either modified their players before sale or provided instructions to the retailers so they could modify or explain to the end user how to modify the players to play discs from other regions. Unless this happened the sale of players would be so slow that the manufacturers would be nuts to continue to provide the resources to fund this tiny market.

So that's Paul Proctor's basic message to me, complete with the URL and email address details for the DVD Video Group, as he suggested. Now, by way of explanation, here's the basic email he sent to them (I've removed the header info):

Hello there.

Fantastic product, but when can the software producers get off their butts and provide Australia with a decent range of titles (over and above the around-150 Region 4 titles currently available).

Catch 22 — until they provide the range of software the consumer wants, nobody will buy the players in any great quantities. Until then, the minority of us who own a player will have to keep importing discs from the US...

Cheerio.

And here's the reply he received back, from a lady called Emily Bradley. Just bear in mind that this is coming from what is essentially a DVD player manufacturers' industry lobby group:

To: Paul Proctor

Subject: Re: Availability of CD's in Australia

Date: 09 April, 1999 18:07

I am sorry that is a problem, and I will be sure to bring that up with our software committee when we meet next in May. This is a collection of the decision makers in the studios' home video divisions, and they love when I can provide them with input such as yours.

Until they are convinced to remedy the situation though, have you tried any of the online retailers? www.dvdexpress.com is a great one — they have a huge selection and provide worldwide service. Hope that is helpful.

Take care,

Emily Bradley, DVD Video Group

Hmmm — very interesting, don't you think? It doesn't sound like the player manufacturers are too worried about people in Region 4 importing their own Region 1 discs, does it?

Anyway, Paul, thanks indeed for those comments and email copies. It's certainly interesting that the DVD player makers' lobby group seems to welcome complaints about the limited range of titles available in our region, and is prepared to use them as ammunition. Quite apart from their willing-

ness to suggest buying Region 1 discs from an online retailer like DVD Express (**www.dvdexpress.com**) — which I can warmly recommend from personal experience, as it happens.

A different slant

Moving on again, our next response came from Mr Brad Sheargold, who asks us to consider a different explanation for the relatively slow sales of DVD players as yet — quite apart from the limited range of movie titles. Here's what he has to say:

I am finding the discussion about DVD extremely interesting and would like to perhaps put another slant on the subject. Perhaps some of the consumer apathy could be put down to 'not having spent $900 on a clock', as those people who went the way of the domestic beta video system are described.

In my lifetime I have seen numerous mediums presented to the public for the storage of audio and video. Some used a common carrier (e.g., a turntable) and were variations on a theme, but still required the outlay on a decoder to make them work to their full potential.

Let me list the systems which come to mind readily:

AUDIO
78rpm records
45rpm records
LP records
SQ encoded records
QS encoded records
CD4 encoded records
DBX encoded records
Reel-to-reel tape recorders, which came in mono, stereo and discrete four-channel models.
Compact cassettes
Eight-track cartridges, which came in stereo and discrete four-channel models.
Four-track cartridges
The 'el-cassette'
Compact discs
DAT
Digital compact cassettes
MiniDiscs
MP3
Dolby Pro-Logic
Dolby AC3
VIDEO
8mm film cameras and projectors
Super-8 cameras and projectors
VHS video recorders
BETA video recorders
U-Matic video recorders
The laserdiscDigital still cameras
VHS camcorders
Analog 8 camcorders
Digital 8 camcorders

If I have missed any please forgive me, but I think you get my 'drift'. Some of these were viable systems which had a long life span as far as the hardware was concerned — LP records and compact audio cassettes for example. Others went the way of the dodo — eight-track carts and digital compact cassette, for example. It appears that even now those who bought a laserdisc player might have difficulty getting software soon.

I know that technology marches on, but perhaps some people are sitting back and sticking with the tried and trusted formats waiting to see if this system 'flies' or another takes its place in a relatively short time.

You're probably right, Brad. There *have* been quite a lot of audio and video formats, to be sure, and it wouldn't be at all unreasonable for people to want to 'sit back and wait to see it fly' before outlaying their hard-earned cash yet again.

Mind you, anyone who's seen a movie — or even part of one — being played from DVD through a decent large-screen TV usually doesn't need too much convincing that the new format has the potential to be a big success. The picture and sound are just so much better than the "tried and trusted' formats like VHS tape, that DVD clearly has the basic credentials for success.

I guess that's why so many of us find the limited range of titles so frustrating!

TV station's logo

As a little addendum to his comments about DVDs, Brad Sheargold also provided a comment about a subject we haven't discussed here before: the growing trend for TV broadcasters to superimpose their logo over most of their programming, in one of the corners — as a kind of 'watermark'. Here's what Brad has to say about this practice:

*On a completely different subject, is anyone else out there 'pi**ed off' at the recent addition of the continual Channel 7 logo in the bottom right-hand corner of the screen? I thought I would get used to it, but still some weeks later it still draws the eye due to its size — and probably more, its position.*

When watching country TV the small PRIME logo in the top RH corner of the screen is bearable, but that large circle is really off putting.

I wonder how many others look at the TV guide now to see what's on the other channels, before choosing ATN 7. Our household has got to the point where we will even try SBS before 7.

Let's hope the other networks don't get as paranoid as 7 and start adding their logo as well.

I can understand logos during sports presentations, as other networks sometimes use footage from someone else and it is a good chance to advertise the source of the material. But to do it continually is really poor.

Why not put the logo in during the commercial breaks? We'd still know we were watching 7 — except when we leave the room for a toilet break, or to put the kettle on!!

Keep up the good work on an excellent mag.

Thanks for that comment/enquiry, Brad. To be honest we're not commercial TV watchers in my household; we simply can't stand the commercials. We tend to watch either the ABC or SBS; if there's nothing worth watching on either, we turn off and read. But I've heard quite a few complaints about the Seven Network's new practice, so I'm pretty sure you're not alone.

It's interesting that the logo is apparently not superimposed on the commercials, though. Presumably the advertisers wouldn't allow this, because it would be seen to distract the viewers and reduce the impact of their commercial...

I guess the only recourse for viewers like yourself who find the logo irritating is to simply turn to another channel, Brad — and preferably let the Seven Network know why you're doing so. If they get enough complaints from unhappy and departing viewers, sooner or later they'll be forced to reconsider their position.

And that's about all we have space for, this time. See you here next month, I hope. ❖

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When the right replacement parts aren't available, use your head!

A couple of our stories this month involve situations where for one reason or another, the right replacement parts simply weren't available. In each case, this involved using a bit of ingenuity and/or creative thinking, to come up with a likely way to solve the problem and get things going again. But of course this can be easier said than done, when you don't have the right test gear to hand either...

OUR FIRST contributor's story for this month comes from Robert Abel, of Condobolin in NSW. Robert has contributed several stories in the past, mostly covering old but worthwhile equipment. This time he gives us two stories, covering the very old and the very new. It seems that Robert is a versatile technician, able to turn his hand to almost anything that comes his way. See what you think of his skills and ingenuity...

A few months ago I was asked by a friend to overhaul two ancient Amstrad word processors which had, more or less suddenly, abrogated their responsibility for reading their discs.

These old machines used two-inch enclosed discs, much like the 3.5" floppies we use today. But I was surprised to find that the disc drive spindles were belt driven, which explained their refusal to operate: the belts had stretched until they no longer transmitted enough torque, especially when loaded with a disc.

Repair was simple, once the drive was opened up (which was not that easy). It was just a matter of fitting new belts — one to each drive, two drives to each machine.

This is not the story I have to tell however, but it explains why I visited my friend, just after she and her husband had returned from interstate to find that their house had been ransacked in their absence. Like most people who have suffered this trauma, it was the invasion that was felt more than the loss of property and so a big house cleaning ensued.

During this exercise, many 'lost' items turned up, including a number of audio tapes of interviews with senior family members. My friend has written a number of books of family history, so these tapes and the tape recorder used to make them were valuable relics.

The tape recorder was a Philips reel-to-reel type, model EL3546. It is a four-track recorder from the early days of stereo. In this machine, the four tracks are used separately in mono mode and up to 13cm reels can be accommodated.

When my friend set out to play some of the tapes, the result was unsatisfactory. So after leaving the completed computer job with her, I took home another job "...to look at in my spare time".

We tried to find a photo of a Philips EL3546 tape recorder as discussed in Robert Abel's story, but this was the best we could do: the very similar looking EL3541, a slightly earlier model using valves.

In the workshop there did not appear to be a lot wrong with the replay section and I had decided to clean the various parts of the tape transport; so I turned the control to rewind the tape I had tried.

The reels turned rapidly at first, then slowed and finally stopped completely. After this the tape would not move either forward or in reverse.

On opening up the case, I could see that the drive belt had come off its pulleys and on closer inspection, noticed that the ungrooved surface of the flywheel rim was smothered with a black tarry-looking mess.

This turned out to be the liquefied remains of the lower idler tyre, which normally contacts the flywheel edge during 'Fast Forward' or 'Rewind'. I could see that the remaining tyre on the idler assembly was soft and sticky and ready to go the same way.

Of course the capstan/flywheel assembly had to come out, together with a number of adjacent parts which had also received a share of the black tar.

I had thought to wash all the bits with petrol to remove the goo, on the assumption that petrol dissolves rubber; but this proved ineffective. At a guess, I suspect the rubber was synthetic and it was only by accident that I found that plain soap and water would do the job.

As you might imagine, the drive belt was very difficult to delouse. But eventually everything was clean again and put back together — except the idler assembly, which now lacked both tyres.

I tried to obtain proper replacements from my usual supplier, suggesting that, given the sectional size — square section 4.5mm — and the internal diameters, they might find replacements amongst the VCR spares. However this idea came to naught, and I was quite worried for a time, because it is obvious that, while my friends could replay a tape satisfactorily without a FF/REW idler, they could only do so from start to finish, which would make transcription of its contents nearly impossible.

After some days in this quandary, I suddenly thought of a possible alternative. 'O' rings are (neoprene?) sealing rings having usually a circular section (though square section rings are made), of various sizes and internal diameters. They are used in all sorts of applications, from snap-in fittings for garden hoses to hydraulic rams on heavy machinery.

SERVICEMAN

When the opportunity arose I went to a nearby service firm and asked them to see if they had 'O' rings in sizes suitable for my purpose — preferably square section, but not exclusively so. In no time at all we found two rings of quite adequate section to fill the grooves of the idler.

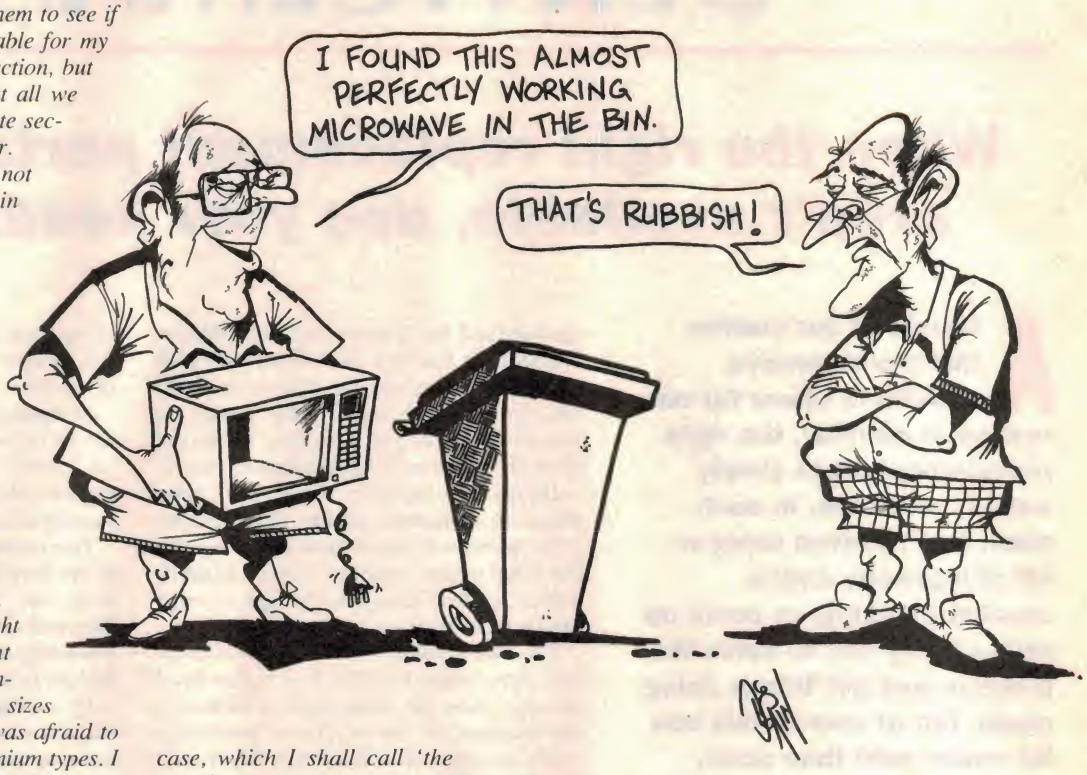
Unfortunately, the rings were not of square section. However in operation it was difficult to see how square section rings would have improved matters, as the torque in both directions was quite sufficient for the purpose.

After a stroke of luck like that, I was all set to refit the case, and perhaps do an azimuth adjustment. But although all modes of tape transport were now working normally, the electronics refused to make any sound at all.

Inspection of the PC board, after de-mounting, revealed a sight I'd forgotten: point-to-point wiring using early style PNP transistors, with lead lengths in inch sizes rather than millimetres and (I was afraid to look) — almost certainly germanium types. I won't go into the time it took me, but eventually the trouble was traced to a scratchy contact in the record switch and after a quick cleanup, I could finish off the job.

We have certainly come a long way since those times, but this old machine is still capable of serving a need and my friend can re-edit her family history tapes on the machine which recorded them.

This was why, on reflection, I packed away my azimuth tape without attempting an adjustment, though it was obviously needed. Doing so could easily have made those very tapes less intelligible.



Tiny connectors

Robert Abel continues:

By way of complete contrast, I had to 'look at' a compact music system of the type now designated as 'Boom-boxes': incorporating in the one unit a CD player, audio tape replay, record, and dubbing, and an FM/AM radio.

The reason for the 'look' was that the reproduction from CDs had suddenly become quite distorted and weak in volume.

I found, once I had discovered the last of the carefully concealed screws which held it together, that the speakers, tape decks, and associated electronics are mounted in the front section of the case and a number of cables fitted with those small plastic locking plugs connect this section to the main electronics PC board, which is easily accessible once the front is removed.

The CD drive, and the control/radio sections are mounted to another part of the case, which I shall call 'the top' for the obvious reason. These sections of course have their own sets of cables and plugs, all of which have to be removed if the main board is to be inspected in depth.

It is a very neat and well thought-out installation. But someone, in fitting the front section to the body, had managed to trap one wire between the case parts at the bottom where it had escaped notice. I expected that this would have caused some trouble, but only the plastic sheath had been damaged.

I didn't find a reason for the CD distortion, but during my search I had trouble with several of the connecting plugs. These tend to lock in so securely that getting them apart can easily destroy the solder bonding the socket to the PC board.

In the end I resoldered all of them before reassembling the unit, so one or more of these may have been the culprit — because the distortion had gone when I tested the CD player.

Surely it is time someone came up with a removing tool to handle these plugs without putting strain on the socket mounting or the cable anchorage? No such tool appears in my catalogues!

For the record, all the facilities were functioning when I returned it to the owner, though the FM reception was far from satisfactory. But then, this place is 'deep fringe' to both of the nearest ABC-FM transmitters, to my profound sorrow.

My own FM reception is little better, despite my 10-metre high turnstile antenna. And I have always wondered why, when FM car radios can be so cheap and so much more sensitive, no one has yet put a decent FM front end into one of these 'music systems'.

Thanks for those stories, Robert. I, for one, have learned a lot from them.

For starters, I always knew that Amstrad was ahead of its time with its computer products, but I didn't realise that they were so far ahead. Those two-inch floppies sound incredibly modern.

Then the idea of using 'O' rings in place of idler tyres had never occurred to me. Of course it makes real sense once you think of it, but how many others have thought laterally in that direction?

And finally, I agree that those sub-miniature sockets need some kind of tool for safe and efficient removal. Of course, they are designed for quick and easy insertion on the assembly line, and no thought is given to the poor sods who will have to service them some time down the track.

Personally, I always warn the owners of this miniature equipment that it was probably not designed to be repaired and even if there is a service manual, it rarely describes a safe way to disassemble the product. So although I will take great care, I cannot guarantee a satisfactory outcome. This is often enough to discourage them from leaving with me a job I didn't want to take on, anyway!

Now you're cooking!

Our next contributor this month is Ian Purdie, of Budgewoi in NSW. Ian's story is another of those tales of junque, but with a difference. He

used almost no test gear and very few tools, to effect a complete resurrection of something he found of great value. Read on...

Mr Halliday's experience in repairing a colour monitor for the cost of 30 cents (EA 10/98), together with similar low-cost repairs featured in recent times, have prompted me to write and relate my own recent experience. I have been actively involved in electronics for about 40 years, both as a hobbyist and in business. Today I live in a retirement village, where we have communal garbage bins.

Recently I found a neighbour discarding a Panasonic microwave oven and he commented "the cost of repair would be better spent on a new one — so you can have it". I suppose that was fair comment, but as we happened to be in the market for a microwave, principally for defrosting purposes, I decided that I would try to see what was wrong!

On opening up the Panasonic, all I could readily determine was a blown fuse. I couldn't believe it would be that easy, and in fact it wasn't.

With the limited test gear available (all the rest had been 'garage saled' along with our previous microwave before we moved here), I was able to determine, by disconnecting the magnetron, diode and filter capacitor, that the power transformer was OK.

The full wave rectifier diodes also appeared OK, but the filter capacitor was a 1uF/2kV unit and looked decidedly dodgy. I had to decide if the cost of a new capacitor of this type was worth the expense, seeing that I didn't know the condition of the one item I couldn't test — the magnetron? I decided to think about it for a while...

Then, wouldn't you know it, about a week later I met up with Bob, a VK2er and neighbour, again at the communal garbage bins. (And no, I don't live in the bins!) Lo and behold, Bob was dumping a microwave oven and commented "I've already spent $170 on repairs to this and I'm sure the magnetron's gone this time. So I'll put the repair money toward a new one".

Talk about deja-vu! Having explained the story about the Panasonic to Bob, he said "Go for it, if you're a glutton for punishment".

Bob's microwave was a Kambrook, and the filter capacitor was 0.9uF/1.8kV unit. I wasn't put off by the slight difference in capacitance and the physical size was identical. But I was somewhat more than worried by the difference in voltage rating.

Deciding I had nothing to lose anyway, I swapped the capacitors over with more than a little bit of difficulty. When I switched on there was no smoke, no flames — and more importantly, no blown fuse!

I reconnected the magnetron, reassembled the case and tried it out. Would it work? You bet it did, goes like a little beauty.

Then came the main test: was the magnetron working? I placed a cup of water inside and switched on. It worked like a charm — boiled that water in no time at all. I ran it for an hour and it didn't miss a beat.

It still serves us well for defrosting and the cost was zilch, except for my time, having fun and exercising the old grey matter. Now the only problem remaining is the missing brown plastic adaptor attached to the turntable motor. Belatedly, I found that it was broken and wouldn't drive the glass plate. And Araldite doesn't work very well at the high temperature.

I'll have to keep my eyes open next time I dump the garbage!

You do that, Ian. And the best of jolly British luck to you. I hope that suitable brown plastic bits appear at your communal garbage bins whenever you visit.

As for comments on the actual repair, Ian was taking a calculated risk in using the under-rated capacitor on this job. The lower than normal capacity may not have been a problem, but 1.8kV is a dicey replacement for a 2kV unit.

Then on second thoughts, maybe not. If you consider the way that the bean counters make engineers prune their designs to meet a price range, then it may be that a Panasonic microwave, having a higher price tag than a Kambrook, may have justified the cost of using an over-rated capacitor.

Whatever happened, the cheaper, lower rated Kambrook capacitor seems to have held up for Ian and he is enjoying unfrozen meals as a result.

Thanks for that story, Ian, and feel free to tell us about any more bargains that turn up at the communal bins. ❖

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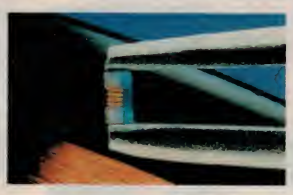

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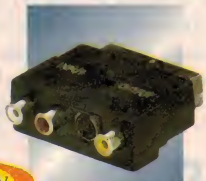

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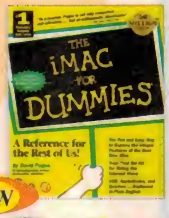

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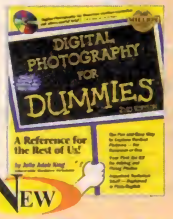

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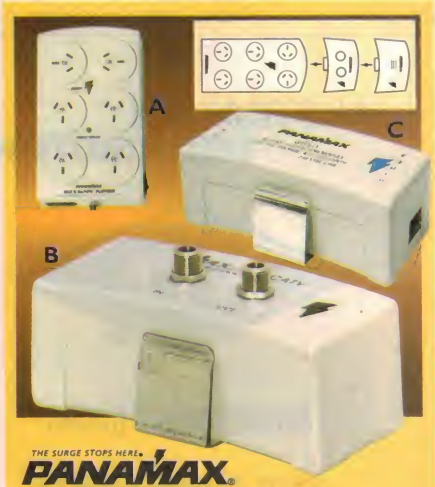

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K 5409

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EA May '99

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EA Jun '99

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EA Aug '99

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SILICON CHIP May '99

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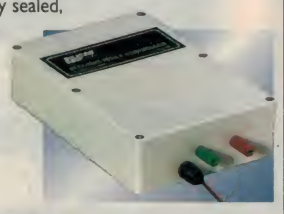

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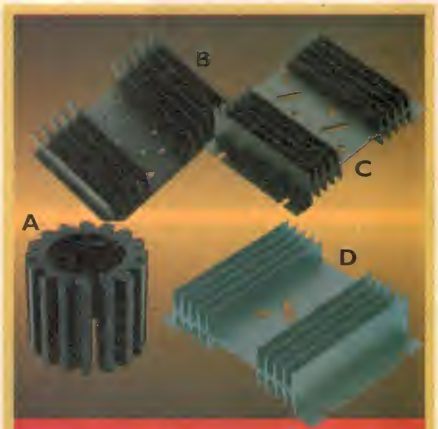

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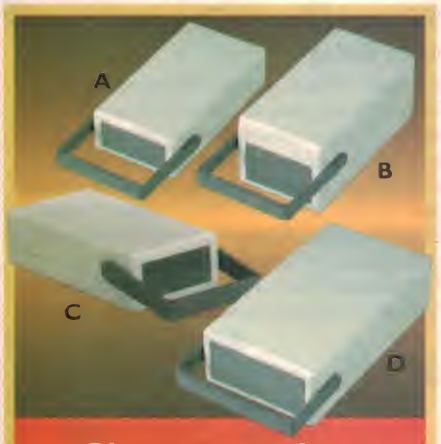

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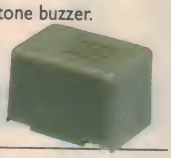

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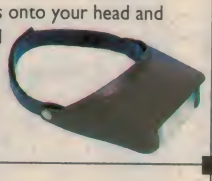

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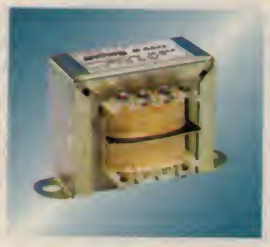

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That's where you go!

Vintage Radio

BY ROGER JOHNSON

Three Healing vibrator radios

Having spent the last three months examining the operation and repair of vibrator units themselves, I think it's timely to tell the stories of some of the typical radios that they powered.

JUDGING FROM THE photos and circuits of 'Healing' radios given in the last few columns, the reader may well ask it the author is a Healing devotee. Well, it happens that by fate and fate alone, I did happen to be at various sales when Healing radios seemed to be on offer, without necessarily going out of my way to look for them. I did at one stage have about 80 of them.

I say it's by fate that I collected Healing radios, because it so happened that my late uncle sold Healing radios from his shop on The Parade, Norwood (Adelaide) in the early 1930s. I was completely unaware of this until informed by my late father some 10 years ago, as he cast a disbelieving (and disapproving) eye around my shed and noted the large number of Healings!

Be that as it may, this month's story is really about vibrator radios in general. I've simply used some Healing models as illustrations, rather than try to limit the discussion specifically to Healing sets in their own right.

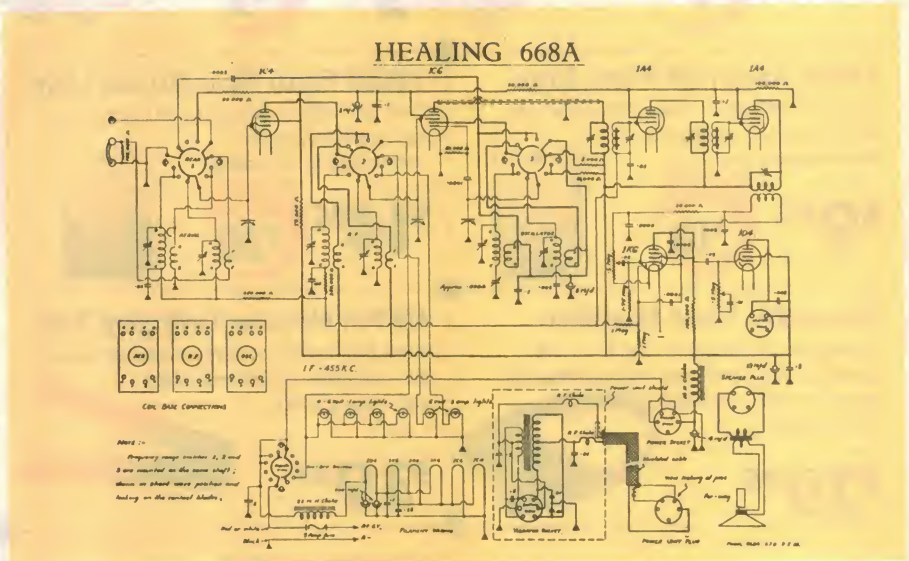

Fig.2: The circuit of the Healing 668-A vibrator-powered console radio, as pictured after restoration last month.

Fig.1: A look under the chassis of a Healing model 401-A vibrator-powered mantel set.

The little 401-A

This model is as about as compact as it was possible to get a vibrator mantel. The same cabinet and largely the same chassis layout, with of course obvious exceptions, was used for the electric model 308-E. It used no shielding of the battery leads, and no metal box to enclose the various elements of the vibrator power supply, and no acoustic suppression of the vibrator cartridge. However, for all that, the amount of 'hash' and extraneous noises creeping into the electrical circuit is remarkably low. As the design and construction was not considered good practice by standards of the day, it is perhaps more by good luck than good management that the amount of interference is as low as it is.

Conversely, the model 57-A mantel from the previous year, which includes one or two more standard precautions, transmits 'hash' through the electrical circuit to the point where it is almost intolerable. Some things just defy explanation!

The 401A is a small four-valver using the

Fig.3: Looking into the rear of the 668-A console, showing the chassis above the shelf and the vibrator power unit beneath it.

pre-octal series 1C6 mixer, 1C4 IF amp, a triode-connected 1K6 detector/audio and the ubiquitous 1D4 output.

The choice of a triode-connected 1K6 over the single ended 1B5/25S is interesting. One can speculate, but perhaps there were two reasons. Firstly, the triode-connected 1K6 has about half the same plate resistance of the 1B5, and a gm (transconductance) of 900 as opposed to 575 of the 1B5, thereby probably giving a little more gain; but the reason was probably more economic than anything else.

Radio manufacturers purchased their valves not in singly packaged boxes as the home constructor and repairman were used to seeing, but in large cartons containing 72 or 144 units. No doubt the more they purchased, the lower the price they could negotiate. The savings must have been considerable, for a 1K6 would have required more wiring time, a shielded lead to the top cap and a valve can as well.

The radio itself was shown last month, and an underchassis photo is shown in Fig.1, with many original components in place. The only replacement items are the 500uF filament filter, and the HT electrolytics which are plainly seen. The original LT filter electrolytic is a large twin unit housed in a metal can measuring 110 x 30 x 45mm and can be seen in the photo. It has been retained for the purposes of originality.

Last month we stressed the importance of ballast resistors to ensure that each valve received its correct operating filament voltage and current. In the circuit it was shown connected across the filament pins of the 1C4, for the very reason explained last month; the 1C4 required zero bias.

When acquired, this little radio was for the most part as you see it in the various photos. The electrolytics were replaced, the valves were checked, it was hooked up to a 6 volt accumulator and it worked! The voltages were within tolerance, and an alignment pepped up the performance a little and it has remained like that for the past 10 years at least. It still worked when dragged out for photographic purposes. For all that, a decent aerial and a good earth does improve performance considerably.

The 668-A console model

Dating from 1938, this is about as big as vibrator radios became — emulating, but far outperforming the six and eight valvers of the early 1930s. It possessed a tuned RF stage, converter, two IF amps, det/AGC/audio and a pentode output. The circuit is shown in Fig.2.

Some manufacturers, AWA in particular, produced a six valve job with RF amp, mixer, IF amp, det/audio, driver and class B push-pull output. The only known set with two IFs *and* push-pull output was a big Airzone of 1941 vintage, containing seven valves in all.

With six valves, one could imagine ballast resistors all over the place to ensure that the valves all had their correct filament voltage and current. However, Healing neatly overcame this trick by using type 1A4-P for the two IF stages.

The secret of the 1A4-Ps is that they only consume 60mA of filament current. Put them in parallel, and *voila*! The filament consumption is 120mA, the same as a 1C4. Better still, when placed in parallel again with the 1K6, the bias is 2.0 volts — about right for the stated figure of 3.0V initial bias for this variable-mu valve.

Nothing has been left to chance for the big 668-A. The rear photo (Fig.3) shows the vibrator box suspended beneath the chassis board. Not clearly shown are the rubber mounting grommets through which the bolts pass. The power unit is shielded, and everything is done properly.

The front view was shown last month with its impressive array of controls, its most handsome cabinet and elaborate dial mechanism.

Switching

In the circuit published a couple of months ago, and the two Healing circuits shown here, we see a three-position on/off switch. The positions are 'Off', 'On - dial lights on' and 'On - dial lights off'. The idea was to switch it on, use the dial lamps to tune a station, and then flick the switch to the third position to leave the set running and extinguish the dial lamps. (Such a configuration was quite common in sets using a 2V accumulator and dry batteries.) The reason was quite simple: dial lamps consumed current and shortened battery life.

In the 668-A things are a little more complicated. Following the circuit, we see that the 'on - dial lamps on' position is connected to the four dial lamps surrounding the main dial, and then a further connection to the wave change switch. A set of contacts on this switch in turn lights a spotlight, which illuminates a rotating shadow disc so that the main stations are portrayed through the little ground glass window at the top of the escutcheon. A separate template was required for each state!

In the shortwave position, the spotlight was extinguished, and another lamp lit a 'short wave' decal on the main dial glass.

The wavechange switch is also a three-position affair, and the positions are 'short wave' (shown switched to that position in the diagram), 'B/C distant' and 'B/C local'. Remember that it is generally not possible to provide any form of back bias with vibrator supplies, and since there is no cathode resistor to increase via a toggle switch or other switching, what happens here is that in the 'local' position, a 25kΩ resistor is connected from the screens of the RF, mixer and IF stages to earth, thereby dropping their voltages by 10 or so volts and reducing the gain accordingly.

In the short wave position, the oscillator anode voltage on the 1C6 was increased

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considerably to 125 volts. This had the effect of slightly reducing the screen current, such that the drop across the screen resistor network was reduced by about another 10 volts, which increased the screen voltages on short-waves and hence gave the set a little more 'oomph'. Of course six valves wired in this configuration could possibly draw 25mA on short waves, which would be way too much load on even heavy duty dry 'B' batteries.

The tone control is a typical Healing arrangement of placing a 0.01uF (or 10nF) in a potentiometer arrangement in the 1D4 grid leak. It has the unfortunate habit of attenuating the 'highs' far more than is necessary when at the extreme grid end, and produces slight muffling and distortion. The top cut treble in the plate circuit is by far and away a better system.

Given that minor shortcoming, the performance of this set is what one would expect — outstanding. Although the audio output is only about 400 - 500mW, it is more than sufficient to fill a large room. The sensitivity and selectivity are both excellent.

The Healing 550-A

The photo of the 1940/41 model 550-A shown in Fig.4 also gives you a good idea of the sorry condition of the large 668-A chassis when found. The cabinet was pretty horrible, too. However restoring a cabinet is within the capabilities of most collectors, and a rusty, dust laden chassis is not beyond restoring. Indeed, the more difficult the job, the greater the satisfaction.

The 550-A was chosen because it had a feature peculiar to Healings for one or two years only, and only on their vibrator radios: variable selectivity.

Fig.4: The sorry state of a 'waiting for restoration' Healing 550-A vibrator-powered mantel in the author's collection. The 668-A was like this, before being restored...

The circuit is a dual wave five valve using the 2V octal series of 1C7-G mixer, two 1K5-G IF amps, a 1K7-G det/AGC/audio and 1L5-G output. Two IF stages instead of one IF stage and one RF stage was not uncommon, and there was little to choose between these alternatives.

An RF stage certainly improved the signal to noise ratio and probably offered a little more sensitivity and selectivity, but two IF stages definitely improved selectivity, where it would be particularly useful on the short wave bands. Against this is the additional cost of a three-gang tuning capacitor, a set of low production RF coils for B/C and S/W, extra switching and wiring, and more time in final alignment. Economics was probably the key issue once again.

Looking at the circuit, we see a four-position main switch. At the bank to the right of the valve filament filter choke, the configuration appears as (1) S/W; (2) B/C with dial lights off; (3) B/C with dial lights on; and (4) B/C variable selectivity. This appears to be an error, in that positions (2) and (3) have been transposed. Another definite drawing error would be in the switch bank beneath the secondary of the first IF. According to the circuit, the S/W position is in broad selectivity, B/C positions (2) and (3) standard selectivity, and in the B/C 'broad selectivity' position the secondary is left untuned!

The chances of this actually being so are remote. It would virtually block the entire IF channel and no signal would pass. More likely, positions (1), (2) and (3) would all be joined together as for positions (2) and (3), and the wiring and connection for position (1) would be at position (4). Over the years one can expect to find the occasional draughting error, particularly in the early days.

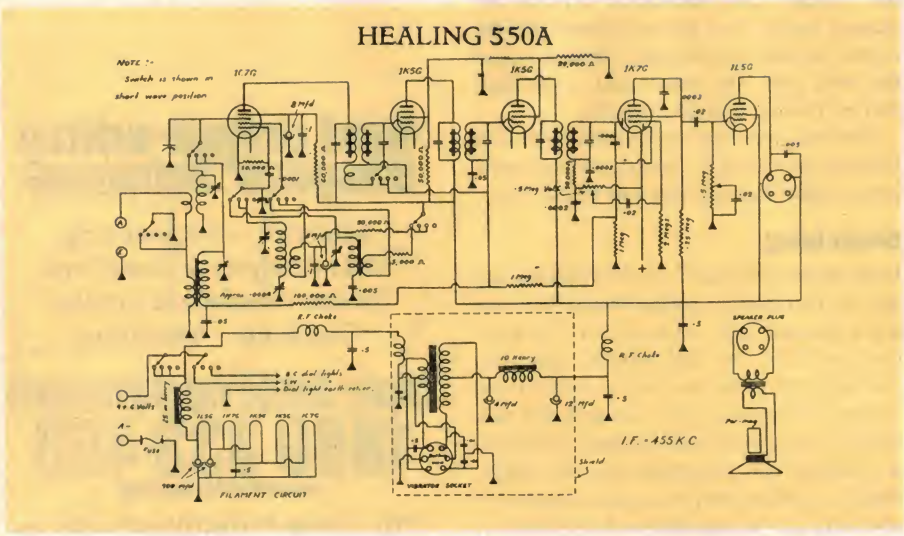

Fig.5: The circuit of the 550-A given in a contemporary servicing guide — with possible errors, as discussed in the text.

Variable selectivity?

But why variable selectivity, I hear you ask? It comes down to bandwidth. A receiver tuned to a given station does not just select that station carrier frequency and that frequency alone. It must be able to tune the carrier plus and minus the audio frequencies that modulate the carrier. In simple terms, this is known as the 'bandwidth'.

If the selectivity is so sharp that the bandwidth is very narrow, it might only allow +/-4kHz, and any audio components over 4kHz will be severely attenuated, if not 'clipped' so that distortion occurs.

In this case of the 550-A the variable selectivity involves a small additional winding on the first IF transformer, only a few turns and connected with reverse polarity to the secondary — but coupling back to the primary. This 'dampens' the primary without detuning or loss of gain, and broadens the bandwidth. In theory this was supposed to deliver a cleaner and better high frequency response.

I hope to check this out, when the receiver in question is restored! ❖

INFORMATION CENTRE

BY PETER PHILLIPS

Projects, measuring fuel flow, CGA video & more...

For the first time in a long while, all our letters this month have something to do with EA projects. We look at problems sent in by readers concerning the March 1994 Four-Channel UHF Remote Control system and the Overspeed Monitor published in February 1997. There's also discussion on measuring fuel flow to an outboard motor, interfacing a PC with a VCR (to record titles etc from the PC), and how to use our January 1998 Flexible Counter Module as an odometer.

ANYONE WHO USES a computer as part of their work will know how essential it is to continually upgrade it to keep up with the latest software and hardware. And without a doubt, today's computer systems are a far cry from those of even five years ago, with capabilities that are often mind boggling. For example, it's now commonplace to import photos from a digital camera, edit them, add text and other enhancements, then produce glossy printouts in full colour.

Another popular and ever developing technology is multimedia, which now allows a computer user to watch a full length movie on a computer monitor and listen to it in surround sound. You can also buy plug-in cards that let you watch television on the screen while you work. In short, there seems to be very little you *can't* do with a modern computer system, especially when it comes to sound and video. But there is a downside as this letter points out:

PC-VCR interfacing

I am a person of 'mature age' (75) and have always been interested in electronics. Of course computers grabbed my interest when they happened on the scene and I spent many an hour at my trusty Commodore 64.

One of my interests was video recording, and programs were available to make up titles etc on the '64 and then transfer them to video to enhance a video recording. Video and audio signals were obtained from the Commodore by simply making up a lead with suitable plugs and sockets, to play directly into the video recorder.

Then along comes the PC with all its bells and whistles. No longer will a simple lead suffice, because of the different horizontal and vertical frequencies compared to the PAL system. I understand that RGB to PAL converters are around, but their cost is well outside my range.

After thinking about it, I decided it should be possible to take the RGB signals from the input of the monitor and combine them with PAL sync signals generated by say an AD722, and so produce a composite signal suitable for recording video to a video recorder. Is this feasible? I'm sure there would be lots of people who would like to put their computer to such a use, so perhaps you can advise me of how this can be done. (J. Schamberg, Woodville West, SA)

I too remember when it was easy to connect a computer to a VCR and title videos and add all sorts of enhancements. At the time I had an Apple II and suitable software, and because the Apple's frame and line rates were close enough to the PAL system, it was easy to record the output video signal directly onto a VCR.

But, like the Commodore, the Amiga and other machines of the '80s, the Apple II is no longer around and we now have the choice of a PC or a Mac, with their much enhanced video systems that are also incompatible with the PAL system. For example, my PC outputs its video at a frame rate of 60Hz, and a horizontal scan frequency of 47.5kHz.

In fact, computer video systems have advanced so much, that it's easy to forget how things used to be. And herein lies a possible answer to your question Mr Schamberg. First though, I think it will be quite difficult to take the RGB signals from a modern computer and combine them with PAL standard sync signals. Taking the frequencies my computer uses, it's tempting to think that as its line rate is three times that of a standard TV set, some sort of division could be accomplished, with every third line taken from the video signal and combined with a suitable external sync signal. But achieving this would be difficult, and the end result might be disappointing.

Another way is go back 10 years and use an old computer system still set up to the CGA standard. By looking around, I'm sure you could buy such a system for a reasonable price, or even get one given to you. Here's a brief run down of the CGA standard, as it's been a while since most people have used it.

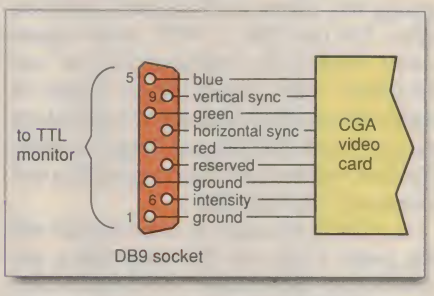

Fig.1: Pin connections for the CGA video standard.

The CGA (colour graphics adaptor) standard was the first colour standard for PC video. It has two basic modes of operation: alphanumeric (A/N) and all points addressable (APA). In A/N mode, the video card operates in 40 column by 25 line mode, or 80 column by 25 line mode with 16 colours. In both modes, characters are formed with an 8 x 8 resolution. In APA mode, two resolutions are available: medium resolution colour mode (320 by 200), with four colours available from a palette of 16; and two-colour high resolution mode (640 by 200). Lousy by today's standards, but very acceptable at the time.

The CGA pinouts are shown in Fig.1, where you'll notice there are four video signals: red, green, blue and another called intensity. These are all digital signals, intended to be displayed on a TTL colour monitor. The colour signals are either on or off, giving eight possible colours (which include white and black). The intensity signal gives two levels of brightness, allowing

further variations. In fact, the CGA system was sometimes called the RGBI system, because of these four signals. But how can these signals be used with a VCR?

I suggest you try the RGBI to PAL encoder/modulator project published in *EA*'s August 1989 issue. This project encodes the CGA outputs into a composite video signal, which is fed to a modulator tuned to channel 1. Because CGA uses a 60Hz vertical scan rate and 15.75kHz for the horizontal scan, most TV sets can be adjusted to accommodate the signal, which is fed to the set via its antenna input.

The circuit is based on a Motorola IC type MC1377, which is available from Altronics for $6.95. The modulator might not be necessary if your VCR has a direct video input. However, I don't know whether all VCRs can handle CGA scan rates, even though these are close to the PAL standard. But it's worth a try.

Another project that could be useful is the TTL-analog Video Converter, published February 1989. I designed this project so I could use an RGB analog monitor with my '286 PC. This circuit outputs four signals: analog red, green and blue, and composite sync. For use with a VCR, these signals would need to be combined into the one composite video signal, which might be tricky. But reading both articles should get you up to speed on this now forgotten video standard, and may let you do something that technology has bypassed.

A problem of course is software that will run under CGA, but for video titling and other simple applications, you should be able to find something, such as an old graphics program. Other readers might have ideas on this subject, and I welcome your comments.

UHF remote problem

The next letter asks about a rather unusual problem with the Four-Channel UHF Remote Control system published in March 1994.

I purchased a kit for the 4-channel remote system from Oatley Electronics and consequently built and commissioned the system to remotely control a pair of garage doors. Only two of the four channels are utilised. The system has been working well for a good number of years, but with one flaw that I'm writing to ask you about.

Everything works as it should, except when the transmitter button on the remote control is held for more than one second. As the button is released the associated flipflop is re-clocked. What this means in practice is that assuming the relay associated with the flipflop was originally released, when a valid code is received the relay operates, but then as the transmitter button is released the relay also releases.

I have traced the operation of the circuit, checking voltages and logic levels, (these appear to be normal), but I am unable to detect the cause of the problem. Indeed, I cannot work out the mechanism by which such an action might occur. I have even totally disconnected all peripheral devices from the receiver board, but still the problem remains. If the transmitter buttons are released at the one second mark or as soon as the valid transmission LED lights, everything works fine. Perhaps you may be able to suggest a course of action to take that would solve this problem. (Lawrie Winter, Logan City, Qld)

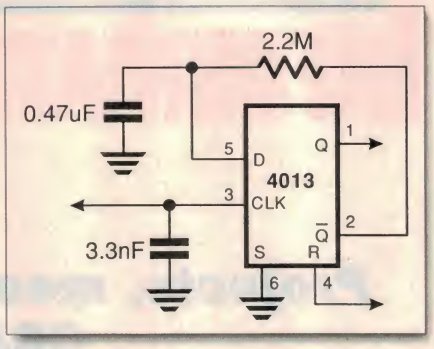

Fig.2: The existing RC network around each flipflop in the Four-Channel UHF Remote receiver.

THIS MONTH'S WINNER!

I've not heard of this problem occurring before in this project, but I do recall a similar problem during the design of an earlier system. Obviously the flipflop is receiving a pulse when the associated pushbutton on the transmitter is released, perhaps due to contact bounce. As shown in Fig.2, to avoid this problem, the circuitry around each flipflop in the receiver includes a 0.47uF capacitor and 2.2M resistor network to give a time delay. To minimise false clocking due to noise, there's also a 3.3nF capacitor connected between the clock terminal of each flipflop and ground.

I suggest you try increasing the value of the 3.3nF capacitor to say 10nF, or even higher. This, as I recall, was the answer to the problem in an earlier design. If this doesn't work, try replacing the 0.47uF capacitor or the 2.2M resistor with higher value components to give a longer time delay.

It's difficult to say why your circuit is giving this problem, Lawrie, given that the fault has not been reported before. You might therefore want to verify that the component values in your construction are correct before modifying the values as suggested above.

Measuring fuel flow

The following letter asks about measuring fuel flow in an outboard motor:

Has EA published, or can you give me a reference to a kit or circuit to measure fuel flow for medium size (75hp 2-stroke) outboard motors? If not have you considered doing so; perhaps with time/range measurements as well? Such a unit would presumably only need a flow sensor and a time reference for a basic setup, as all fuel passing the sensor is used (or wasted). Ability to input tank capacity would also be useful. (Tony Norman, email)

The closest thing we've done that answers your question Tony is a car computer project published in March 1996. This computer has lots of functions, such as speed, engine RPM and others that might not apply to an outboard motor, but it uses a standard fuel flow sensor and can be calibrated to suit. The project was designed by Oztechnics, and you can find more information about it by visiting the Oztechnics website at: **http://www.oztechnics.com.au/68c05.htm**.

Other than that, we haven't done a fuel flow project since 1983, when we published a project called an Analog Fuel Consumption Meter. I don't have the details of this project, but a copy of the article is available through our reader services.

Overspeed monitor

Staying with things automotive, here's a letter that describes a rather strange problem with the Overspeed Monitor published in February 1997. But perhaps it's not a fault in the design...

I recently completed and installed your Overspeed Monitor in my 1983 Mercedes Benz, and I think it's great. I think everyone should have one, and it will certainly save my licence which has attracted a few too many points!

I modified the installation slightly by substituting the potentiometer with a 3-position (make before break) switch of the type used on a Fender Stratocaster, wired to select the wipers of three multi-turn 100k trimpots which are all connected across the regulated supply with a 150k and a 1k resistor, as in the original circuit. This provides three presets which I have set to trigger the alarm at speeds of around 65, 75 and 105km/h.

The circuit behaves consistently and accurately, but when the car speed is around 5km/h above each preset, the circuit oscillates, sounding like a sick rooster. Above this range everything behaves as it should, with the alarm giving its usual beeping tone. I imagine the effect has something to do with the threshold of the LM308 comparator. Did you experience this effect? Thanks again for another great design. (Ian Horacek, email)

We certainly didn't experience the 'sick rooster' effect Ian, otherwise we would have modified the design! I agree the problem is due to instability around the LM308 comparator, and I wonder if your modification is responsible.

The design of a comparator circuit is usually quite critical, especially the layout of the printed circuit board. Any stray capacitance can upset the operation of the circuit, and I suggest your extra wiring and the switch might be the cause. In the original design, the potentiometer is mounted on the PCB, right next to

the comparator to minimise stray capacitance.

From your letter, I assume you've added the switch and extra pots by connecting the switch to the PCB with wires, and connecting the pots to the switch with further wiring. All this adds up to quite a bit of capacitance, possibly enough to make the comparator unstable at certain signal voltages.

You might try connecting a 10k (or higher) resistor between pin 2 of the comparator and your external wiring. The aim is to try and isolate the capacitance effect, and introducing a series resistor might help achieve this. Another possibility is to add a small amount of positive feedback to the comparator, making it behave like a Schmitt trigger. To do this, try connecting a 10M (or less) resistor between the output of the LM308 (pin 6) and the inverting input (pin 2). This will mean resetting your pots, but it could solve the problem.

Otherwise, you might need to shorten the extra wiring, or return the circuit to its original layout. Comparators are tricky beasts, and will oscillate very easily.

Counter as odometer

The next letter asks about interfacing a Hall effect sensor to the Flexible Counter Module in the January 1998 issue.

I have constructed a digital speedo using a UGN3503 Hall effect sensor which outputs 2.5V, dropping to 2V when a magnet passes by. I plan to use the counter module as an odometer, by connecting the UGN3503 to the counter. However it appears the output of the device has insufficient amplitude to drive the counter. I would appreciate any suggestions or a suitable circuit to adapt it to the counter. (Dr Laurence Zalokar, Ungarie NSW)

The 4029 counter in the counter module is an edge-triggered device Laurence, and needs more than a 0.5V transition to clock. So as you say, you'll need some sort of interface between the sensor and the counter module.

There are a number of possibilities, such as the Hall effect interface circuit in the aforementioned Overspeed Monitor, in the February 1997 edition. You might also get some ideas from the Hall Effect Speed Sensor project published in August 1991.

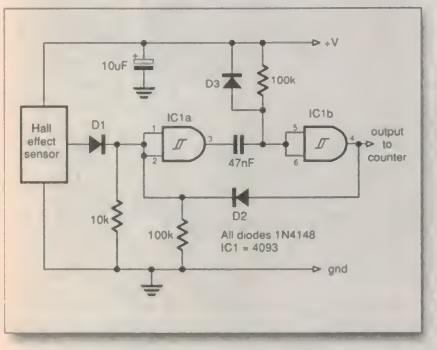

Fig.3: A way of interfacing a Hall sensor to the January 1998 Flexible Counter Module.

The problem to overcome is the need to get a sharp pulse that can clock the counter. The sensor won't provide this without extra circuitry. In principle, the interface needs to be some sort of monostable that produces a pulse each time the magnet passes the Hall effect sensor. This pulse can then clock the counter.

The circuit in Fig.3 is from the Overspeed Monitor, and should suit your needs. The supply voltage (+V) is 9.4V, derived from a voltage regulator supplied with 12V DC. Although it's likely the circuit will work with 12V, some sort of voltage regulation will be needed, both for the counter module and the Hall effect interface circuit. You could use either a 3-terminal voltage regulator or the zener diode series transistor regulator circuit in the Overspeed Monitor.

The circuit in Fig.3 forms a monostable, and outputs a positive-going pulse for each transition of the magnet. This pulse will be able to clock the counter. I'm not sure from your letter if you will be using the same sensor to drive your digital speedo and the proposed odometer, but if so, you'll need to consider the loading effect of both circuits. Perhaps the interface can be used to drive both the speedo and the odometer.

What??

The question this month was sent to me quite a few years ago by Wayne Spaulding (Abbotsford, NSW). It was presented in *ETI* in 1969, and Wayne was one of 20 who got the right answer from a total of 120 contributions. All you have to do is find the resistance between points A and B for the circuit in Fig.4.

Win this great Contrib of the Month Prize!

As an added incentive for readers to contribute to this column, we're now offering a valuable prize to the question judged most interesting, or the answer/response judged most informative, each month. The prize is a Mod-Col 38/54 high-res PAL colour video camera module from sponsor Allthings Sales & Services, with 450 lines of resolution, built-in digital signal processing, electronic shutter and auto gain control

— valued at over $400!

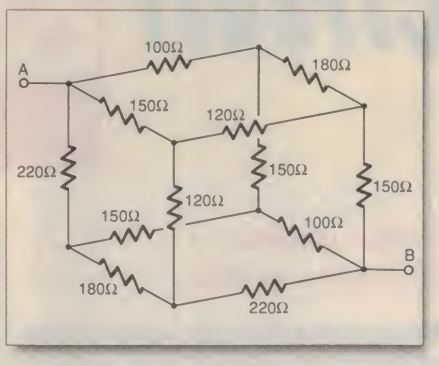

Fig.4: Find the resistance between A and B.

Fig.5: The solution to July's What?? question.

$P_T = 8 \times I$

$P_T = 12mW + I^2R_2$

$8I = 0.012 + 1000I^2$

$1000I^2 - 8I + 0.012 = 0$

Solve the quadratic with:

$$I = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

where:

$a = 1000,\ b = 8,\ c = 0.012$

$$I = \frac{-8 \pm \sqrt{64 - 4(1000)(0.012)}}{2000}$$

$$I = \frac{12}{2000} \text{ or } \frac{4}{1000} = 6mA \text{ or } 2mA$$

If $I = 6mA$, $R_2 = 333.3\Omega$ and $V_{R_1} = 6V$

As $V_{R_1} = V_{in}$, $A_V = \frac{8V}{6V} = 1.33$

If $I = 2mA$, $R_2 = 3k\Omega$, $V_R = 2V$ and $A_V = 4$

Answer to July's What

There are two answers: closed loop gain (Av) of 1.333 or 4. The workings are shown in Fig.5 if you didn't get these answers. ❖

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Circuit & Design Ideas

Interesting original circuit ideas and design tips from readers. While this material has been checked as far as possible for feasibility, the circuits have not been built and tested by us. We therefore cannot accept responsibility, enter into correspondence or provide any further information.

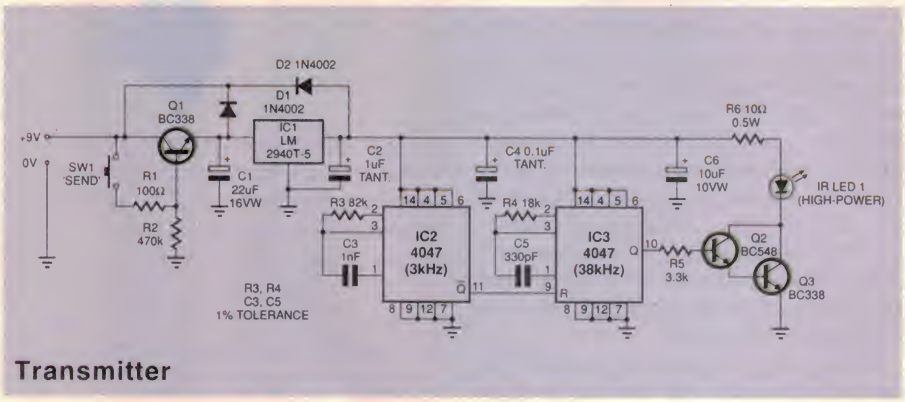
Single-channel IR remote control

Most of the infrared remote-control transmitter/receiver sets currently on the market are only available in multi-channel versions. The size and cost of these units is unnecessary if only one channel is needed. Also, when only one channel is used on a multi-channel transmitter, confusion can arise about which button to press. This is avoided if the unit has only one button.

A single-channel type does not require specialised codes because the receiver does not have to differentiate between signals. It does, however, need some means of preventing false triggering when lights are turned on and off, etc. This unit achieves this by modulating a tone of about 3kHz onto a carrier with a frequency of approximately 38kHz. The receiver detects and demodulates the carrier frequency, then triggers if the 3kHz tone is present.

It works in either latching or momentary modes. If the button is pressed for less than half a second, the relay will be latched 'ON'. If, on the other hand, the button is held down for longer than half a second, the relay will switch off when the button is released.

In operation, Q1 is used as a switching transistor, switching power to regulator IC1 when [SEND] is pressed. IC1 has an output of 5V DC that powers the main circuit. An LM2940T-5 low-dropout regulator has been used for IC1 to get the most from a battery. It should function correctly down to about 7.2V. (This is well suited to the characteristics of a 9V NiCad battery). IC2 is set up as a 3kHz oscillator, which enables IC3 each time its Q-bar output goes low. IC3 is a 38kHz oscillator, driving the IR LED via Q2 and Q3, which are configured as a Darlington Pair.



Transmitter

The receiver uses IC5, a PIC 12043 IR receiver subsystem, to do much of the hard work. It contains an AGC preamp, detector and demodulator, (tuned to 37.9kHz), all in one package. It sends an inverted, digital copy of the original 3kHz signal to IC6, an LM567 tone decoder/PLL IC. The output of this IC is on pin 8, which goes low and triggers IC7a when a 3kHz tone is detected.

IC7a is half of a CD4013 dual-D flipflop and is wired as a 450ms pulse generator, which acts as a debounce for the incoming signal — ensuring that only one pulse is produced if the button is pressed for less than half a second.

IC7b is the other half of the CD4013, configured as a toggling flipflop. The output is low when power is first applied, then toggles between states when [SEND] is pressed, turning the relay on or off. The receiver power supply can be any 12V DC source capable of supplying more than about 150mA continuously.

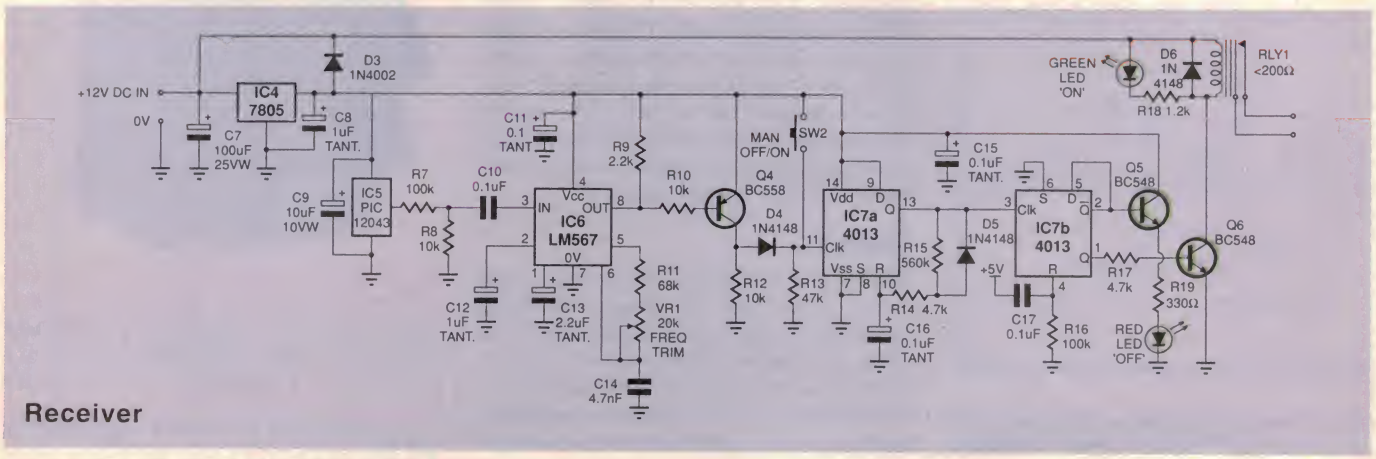
After assembly, the receiver needs to be tuned to the modulation frequency of the transmitter. Begin by setting VR1 on the receiver fully anti-clockwise. Now point the transmitter at the receiver and press [SEND]. While holding the button down, slowly turn VR1 in a clockwise direction until the relay switches on. Take note of the point on VR1 at which this happens. Now do the same in the opposite direction. Next, set VR1 exactly between the two 'switch-on' points. The unit should now operate correctly, with a range in excess of 20 metres depending on light conditions.

Note that the IR LED should only be of the high-power type, about 130mA average. Also, if the transmitter is only powered in bursts of less than half a second, R6 can be decreased to 5.6 ohms for increased range. Also, R3, R4, C3 and C5 should be as close as possible to their rated values, preferably within 1%.

If any readers are interested, a kit form of this unit will soon be available from me. Enquiries are welcome on (02) 6654 5458.

Steve Carroll
Timsvale, NSW **$40**

THIS MONTH'S WINNER!



Receiver

As an added incentive for readers to contribute interesting ideas to this column, the idea we judge most interesting each month now wins its contributor an exciting prize, in addition to the usual fee. The prize is an open order to the value of $300 from Oatley Electronics! Yes, that's $300 to spend on anything you want from Oatley's wide range of products, so check out their ad (or their Website) to see what's on offer.

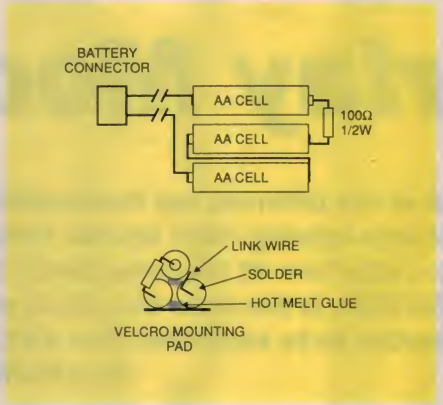
Win our 'IDEA OF THE MONTH' Prize!

PC's CMOS battery replacement

At my place of work, several computer CMOS setups began to fail on a regular basis. Checking the on-board battery revealed that the computer's clock battery, a type 840, contained three alkaline cells (4.5 volts total) that had reached the end of their (two year) useful life. I then found that these batteries retail at around $40 each...

After checking the internals, I found that three standard AA alkaline cells wired in series with a 100Ω current limiting resistor is a much more cost effective solution. AAA cells could be used, but are generally more expensive than the AA size.

The original battery lasted around three years (one of the first 486DX33 computers, and still useful for a range of DOS based programs), since AA cells have a much greater capacity than those inside an 804 battery, they should last for at least their shelf life in a typical computer.



Soldering the leads from the old battery, rather than placing them in a holder, prevents the usual corrosion and poor contact problems that eventually occur. The cells are held together with a dab of hot-melt-glue and finally enclosed within a length of heatshrink tubing. The original battery had a patch of 'Velcro' material, which was reused and stuck to the heat shrink tubing.

So far we've replaced 10 of the 804 batteries with the above units, saving us some $350, (based on the above units costing around $5 each.)

These units could be used to replace the on-board NiCad battery used in some units. Some of these have a nasty habit of leaking when allowed to discharge completely over extended periods, causing considerable damage to the motherboard.

Peter Harle
Liverpool, NSW $25

Two ICs drive two stepper motors

All stepper motor driving circuits I have seen either use expensive specialised ICs or use between two and four logic ICs per motor. This circuit uses only two inexpensive logic ICs and can drive *two* four-wire stepper motors. I have managed to comfortably fit all the parts on a PCB only 40 x 70mm square.

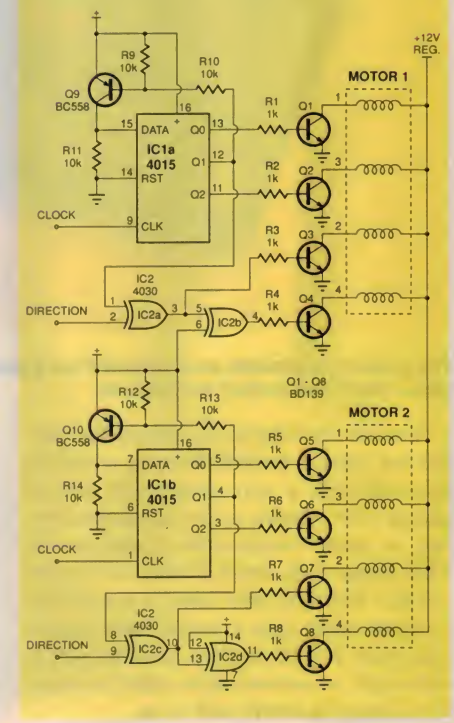
A 4015 dual four-bit shift register generates most of the motor control signals on outputs Q0 and Q2, while the second output (Q1) is connected back to its data input via a PNP transistor configured as an inverter. In this way the first two clock pulses will transfer a logic high to outputs Q0 and Q1, but on the third clock pulse the data input will be low, thanks to the inverting action of the PNP transistor.

Things get a little more complicated after the third clock pulse, but the final truth table is as shown, and the outputs could be used to drive the stepper directly (with outputs Q0 and Q2 to the first winding and Q1 and Q3 second winding). The only problem is that we want direction control as well.

The two exclusive OR gates are used to invert, on request, the control to the second winding, thus allowing direction control. A high on the direction control line will drive the motor anticlockwise and a low will drive it clockwise.

The four output transistors each drive one wire of the four-wire stepper motor, and the one or two centre tap wires of the motor must be connected to the positive rail. This circuit could also be adapted to drive the stepper motors with two H-bridge drivers. I have not used this method, as the above way seems to give the same results as the H-bridge driver and it only uses four power transistors per motor compared with eight for an H-bridge.

Clock	Q1	Q2	Q3	Q4
(start)	0	0	0	0
⌐	1	0	0	0
⌐	1	1	0	0
⌐	0	1	1	0
⌐	0	0	1	1



With the addition of a pen up/down solenoid driver, this circuit can be connected to a computer's parallel port as an inexpensive plotter driver.

Mark Evans
Floreat, WA $30 ❖

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PC-Driven Video Text Overlay Module

Here is the first of two different, but functionally similar projects which are able to overlay text material onto existing video signals. Both projects take advantage of a new multifunction chip from ST Microelectronics designed expressly for this type of application, the STV5730A. In this case the chip is used in a 'bare bones' configuration which allows its operation to be controlled from a PC, via the printer port. This makes it very flexible, in terms of what it can display.

BY JAMES BARKER

FOR MANY YEARS, I have seen 'typewriter text' superimposed on television images. Since I joined an amateur TV club over five years ago, I have been trying non-stop to use similar technology to superimpose an amateur television callsign identifier on the video signal for ATV transmissions — as an alternative to the 'low tech' solution: a piece of cardboard on a string from the roof of the radio shack.

At first I tried a circuit using the fairly common LM1881 sync separator chip, an EPROM and a TEA2000 video encoder. It worked, but gave rather 'chunky' characters.

After searching and trying a few other circuits, I recently stumbled over the STV5730 integrated circuit, from ST Microelectronics. This is a fairly new chip, especially designed for the job of producing on-screen menues and other displays for VCRs, Pay TV set-top boxes, DVD players, satellite TV receivers and so on. It's a very powerful chip, containing just about all of the circuitry needed for on-screen text displays locked to an existing video signal.

I found a Technical Note for STV5730 on the ST Microelectronics web site, which gave a simple PC-driven circuit for evaluation — plus some downloadable software to get you going. Voila! So I wasted no time in designing a PCB to try it out, using the tech note circuit as a good starting place...

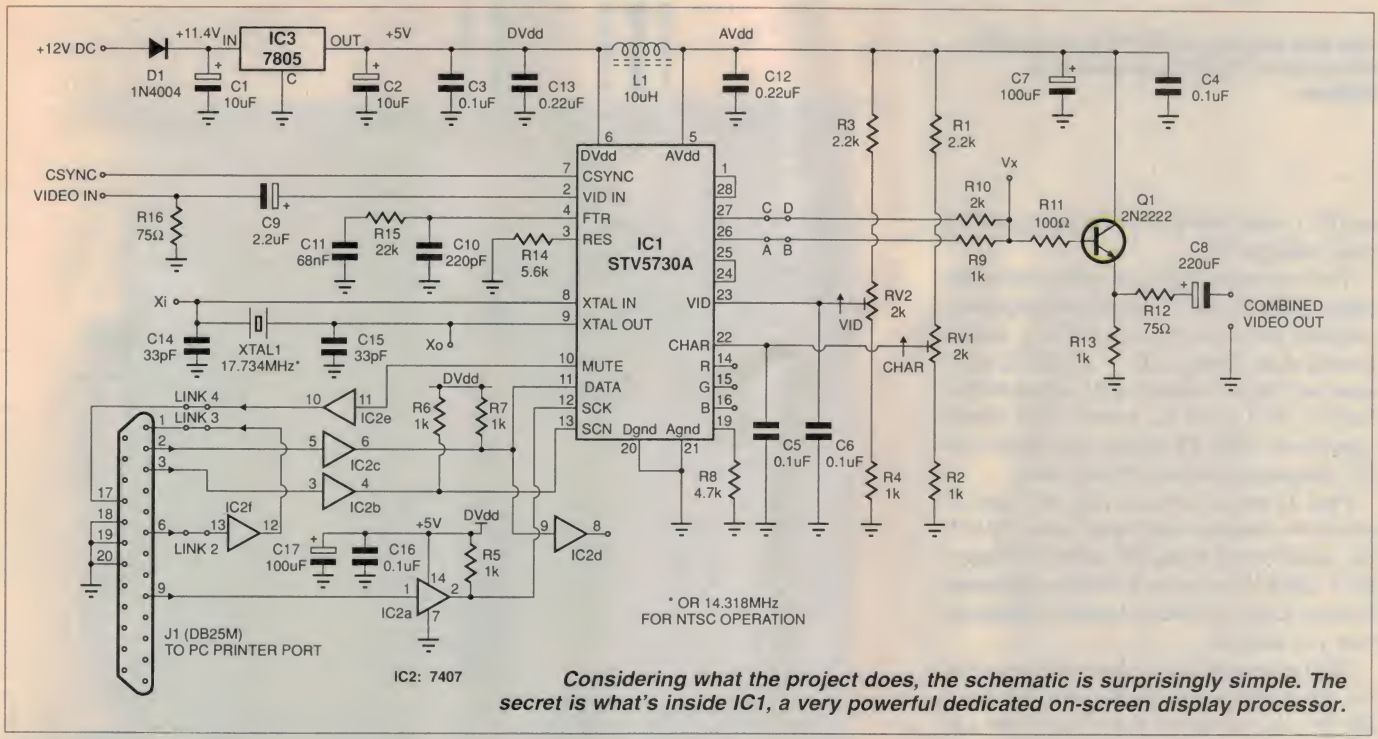
Unfortunately by the time I'd finished the board pattern, I found out that the original DIL-package version of the IC was no longer available, having been replaced by a 28-pin surface mount device — the STV5730A. So the PCB artwork was hastily redrawn, I had a couple of prototype boards made and these were used to build up my prototypes. And suddenly I had what I've always wanted: a really simple, low cost way to put text onto a video image.

The prototype module was mounted on a simple L-shaped metal bracket, to support the video input and output connectors.

Now my own aim in developing this project has been to provide amateur television operators with a very economical way of putting their callsign on the transmitted picture, to satisfy certain radio regulations and allow others to be aware of who's who when 'on air'. However after using it for a while I'm now aware that it would have various other uses as well, such as allowing you to add simple on-screen text to video for transfers, archive recording and so on.

It's true that various commercial 'TV typewriters' have become available over the last few years, with prices gradually dropping from about $2000 down to $500. But this is still a rather expensive kind of gadget to use just for callsign ID or adding ID 'headers' to tape copies or archive tapes.

This little On-Screen Display or 'OSD' project will cost you a heck of a lot less (no more than about $50, I estimate) and allows you to use your PC as a TV typewriter, with



Considering what the project does, the schematic is surprisingly simple. The secret is what's inside IC1, a very powerful dedicated on-screen display processor.

a surprising amount of flexibility. It simply hooks up to the PC via a standard Centronics parallel printer port, as found on virtually any old PC you might want to use.

At this stage I haven't been able to develop special software for the PC to take full advantage of the STV5730A's features and flexibility, or make it easier to prepare on-screen messages. So that this stage it's really a matter of using the 'freeware' demo software developed by ST Microelectronics, and downloadable from their website (and hopefully from the *Electronics Australia* website), to at least get you going.

This demo software is a bit clunky, but those of you who are good at programming will find quite a lot of info on the STV5730A's commands and how its registers are accessed, in the STV5730 Tech Note and data sheet. These are both downloadable from their web site, and I'm sure a hotshot programmer will be able to use the info to produce a really impressive TV Typewriter program.

What's possible

The basic capabilities of the STV5730A are to display 11 rows of text, each with the capacity of up to 28 characters per line in 'zoom 1' mode. Zoom mode 2 means a couple of rows at 14 characters per line; zoom mode 3 means that the characters are three lines high, and finally zoom mode 4 has characters four lines high. All this means is that you can get larger characters — at a price in terms of fewer characters per line, and fewer lines on the image.

You have a choice of eight basic character colours, while each character, line or screen of text can be given other 'attributes': it can blink; be transparent, translucent, or opaque, etc. You can also do other tricks like turn the background on or off, give a line a vertical or horizontal offset, or of course vary the line's zoom level. These are just some of the possibilities.

Basically the STV5730 comes with a built-in 'font' of 128 characters, stored in ROM. These include the full upper case (capitals) and lower case letters, the numerals 0-9, basic punctuation marks, various European variations of upper and lower case letters, and a selection of special symbol and 'dingbat' characters like arrows, six crude graphics block characters, a heart, a clock face and a tiny 'satellite antenna'.

All of these characters are based on an 18 x 12 pixel matrix, so they're much cleaner than the usual 'CGA' (7 x 5) or 'VGA' (11 x 6) characters. In fact they're even better than the usual SVGA fonts, which are based on an 18 x 10 format. They're basically in a clean and uncluttered 'sans serif' font, rather like the 'Helvetica' or 'Arial' font you find in many Windows computers.

The bottom line is that this IC can do all kinds of tricks; it's very flexible. Hopefully more can be published about its capabilities in the coming months.

How it works

I'm not proposing to go into a lot of detail about how the project works, because it's really all centred around the STV5730A wonder chip — and that's pretty complex, inside. The rest of the circuitry is really just to provide it with power and clock signals, get video into and out of it, set its operating conditions and allow your PC to squirt text into it for display on the screen.

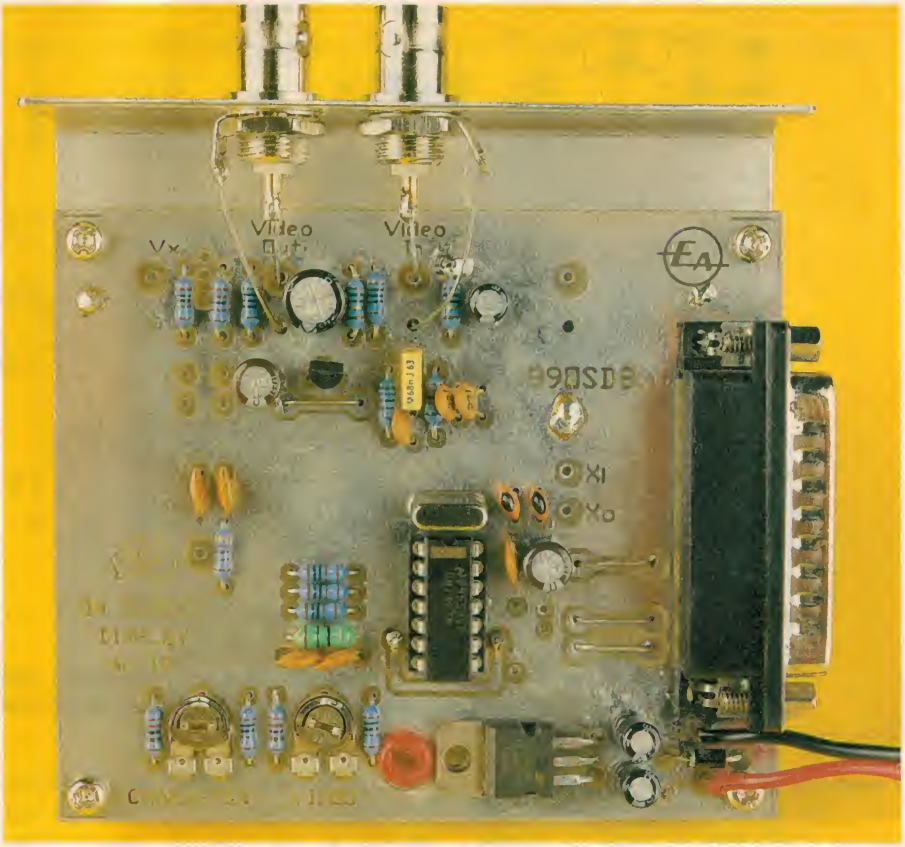
Referring to the schematic, video from your camera or VCR is fed into the STV5730A (IC1) via coupling cap C9, with 75Ω resistor R16 giving the right termination. The chip is also supplied with +5V DC via two different supply pins — pin 6 feeding its internal digital circuitry, and pin 5 the analog circuitry. As you can see pin 6 is fed directly from regulator IC3, while pin 5 is fed via a 10uH RF choke — which also supplies the video output buffer Q1.

Although IC1 uses an internal phase-locked loop (PLL) to derive many of its timings from the incoming video (a built-in 'genlock'), it also needs a clock signal. This has to be at four times the TV colour subcarrier frequency, so for PAL it has to be at 17.734MHz. (The chip can also be used for NTSC, by changing the clock to 14.318MHz — so this is a truly 'multinational' project.)

As the chip has the makings of a clock oscillator inside, all we need to get the clock signal is hang a suitable crystal between pins 8 and 9 — together with a pair of small capacitors to give it the correct resonating capacitance. So that's the reason for XTAL1, C14 and C15.

Note that since the STV5730A can also accept an external clock signal, it's possible to 'slave' a second chip by feeding it with the clock from an existing one. In fact I've provided two terminals on the PCB (labelled 'Xi' and 'Xo') to allow this to be done easily. To drive the second one you'd simply link its Xi terminal to the Xo pin on the main module.

By the way components R14, R15, C10



Use this closeup of the PCB as a guide when you're building up your own module.

and C11 seem to be part of the timing for the chip's internal PLL.

The video-plus-OSD text comes out of the chip via pins 26 and 27, and as you can see we combine these via resistors R9-R11, before feeding them through Q1 — a 2N2222 transistor serving as a simple video output buffer. Resistor R12 gives the correct 75Ω output impedance, while C8 ensures that there's no DC component fed out with the video.

Pins 22 and 23 on the chip are used to adjust the character and screen intensity levels, respectively, using DC control voltages. RV1 and RV2 are used to allow adjustment of these levels, so you can get the display to way you want it.

Now all we need to explain is the way that we get character information into IC1, from the PC via its printer port. That's the job done by IC2, a 7407 low cost TTL hex buffer chip.

Basically the STV5730A is designed for control via an I²C three-wire serial interface bus, using pins 11 (serial data input), 12 (serial data clock input) and 13 (serial chip select input). As you can see, these are simply fed from printer port pins 2, 9 and 3 respectively, via three of the buffers in IC2. As the 7407 buffers are of the open-collector type, they use 1k pullup resistors to drive the IC1 inputs correctly.

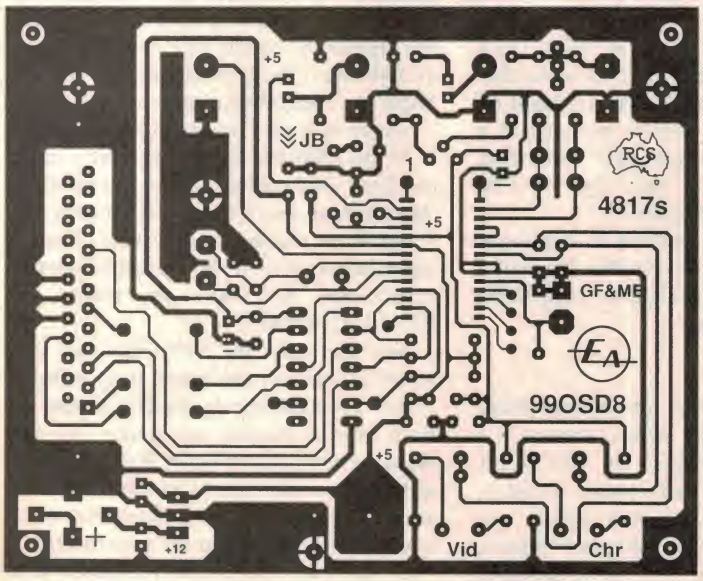
So that the PC software can tell when the module is connected to the printer port and 'alive', buffer IC2f is used to link pin 6 back to pin 1 for 'handshaking'. Also since the software needs to be able to tell when IC1 is being fed with valid composite video input, buffer IC2e is used to link the 'video present' output pin of the chip (pin 10) to pin 17 of the printer port connector.

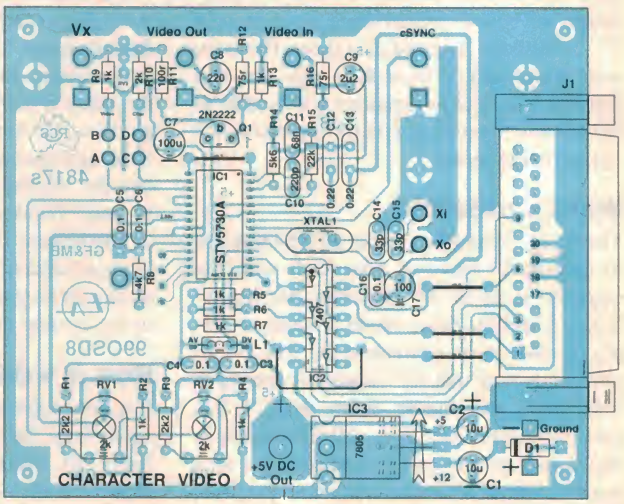
That's about it, then. Everything fits on a small PCB measuring 96 x 80mm and coded 99osd8, with the DB25 connector mounted on one end. This is simply connected to the PC's printer port via a DB25 to DB25 extension cable.

Assembling it

First of all I recommend you inspect the PCB for shorts and open circuits, before you start assembly.

Then I suggest you populate the 5V regulated power supply, and perhaps solder in the DB25 connector and the four straight wire links shown in the PCB overlay diagram. The 'U' shaped link that runs around the end of IC2 is merely to stop the input of unused buffer IC2d from 'floating', so it can be left





The component overlay (above) and the PCB artwork (left), shown here actual size.

until a bit later if you wish (but don't forget it).

Now solder in all the other components, including the two trimpots and the 14-pin socket for the TTL 7407 IC. Take care with the polarised components, like the electros, diode and transistor Q1. The video in and out sockets are mounted off-board, but you might want to fit some short lengths of tinned or insulated copper wire, ready to make the connections when the board is complete and mounted on a metal bracket or whatever.

A word of caution here about the transistor, Q1. The PCB is marked according to the connections for a 2N2222 transistor; note that some plastic-cased PN2222 versions from un-named component suppliers have the emitter, base and collector connections are transposed, which can lead to problems if you don't notice. In any case a BC547, BC548 or similar can be substituted here without any problems...

Do not solder the main surface-mount IC under the PCB as yet — be patient. First hook up the PCB to a source of nominal +12V DC power, and test the 5V regulator chip IC3, looking for the correct volts in and stability of volts out. I also suggest you check the supply voltage points around the circuit, taking special care that the DC voltages on the wipers of trimpots 1 and 2 can only be varied from about 0.95V up to around 2.88V. The voltages from these trimpots, applied to pins 22 and 23 of the soon-to-be-soldered-in surface mount IC, **must not exceed 3.0 volts** or 'the smoke will escape' and your most valuable IC will die soon after it's soldered in place.

Also check pads 5 and 6 on those waiting for IC1 under the PCB, and ensure that +5V is present on these pads — but on none of the others. As the chip is fairly pricey, I suggest that you check all the voltage points around these PCB pads, and re-check. A mistake could be expensive!

By the way the PCB has a top ground plane for the purpose of limiting any RF transmission and/or picking up any RF — although as we are working at a nominal 1V p-p, the latter is less likely than the former. I intend building and trying out versions using a single-sided PCB, as this might work OK, especially if mounted in a simple metal enclosure to provide a measure of RF shielding.

Now with no obvious problems, it is time to bite the bullet. So turn off the power supply, ensure the PCB is fully grounded with no charged capacitors or static electricity. You can now insert the 7407 IC into its socket.

A quick turn-on of the power supply and you should be able to check that all appears to be well on the pins of this IC. Note that it's a hex buffer with no inversion, so a positive on any one of the input pins should result in the same at the corresponding output — except at pin 8, which doesn't have a pullup resistor as we're not using it.

A quick check of the video in and out signal levels would be a good point here, too.

Now if all pins appear to be correct, turn off the power supply, remove the video signals and wait for all electros to fully discharge (have a coffee — it may be cheaper than you think). Then taking note of pin 1, carefully solder in the special STV5730A surface mount IC under the board. I suggest tacking it in by soldering pin 1 to the corresponding PCB pad first, and if necessary reheating this joint and 'nudging' the chip until its leads are sitting squarely over all of the other pads. Then you can quickly solder the others. The emphasis here is on taking great care, and even more care, not to damage the chip due to either overheating or static discharge. Also be careful where you place the PCB once the chip has been fitted, as a short from now on may well be very expensive.

Finally it's time to solder in the colour genlock crystal, too. Your OSD module should now be complete.

Final checkout

Now connect the video out to the direct (AV) video input of your TV or video monitor, or camera input of the VCR, etc. Then connect the DB25 connector up to the printer port of your PC, into which you've installed the demo software.

By the way the demo software runs under DOS and seems to have to be installed in a subdirectory called DATA. So make a directory of this name on your hard drive and copy the supplied ZIP file into it, unzipping the file to unpack everything.

(Continued on page 73)

Fig.1(above): Here's the display you should get using the demo software to download DEMO1.DAT into the module. The bottom line should be blinking.

Parts list

Resistors

All 0.25W 1% metal film, unless specified:

R1,3	2.2k
R2,4,5, 6,7,9	131k
R8	4.7k
R10	2k
R11	100 ohms
R12,16	75 ohms
R14	5.6k
R15	22k
RV1,2	2k horizontal trimpot

Capacitors

C1,2	10uF 16VW RB electrolytic
C3,4,5, 6,16	0.1uF MKT
C7,17	100uF 10VW RB electro
C8	220uF 10VW RB electro
C9	2.2uF 10VW RB electro
C10	220pF ceramic
C11	68nF MKT
C12,13	0.22uF MKT
C14,15	33pF NPO ceramic

Semiconductors

IC1	STV5730A OSD chip (SMD)
IC2	7407 hex buffer
IC3	7805 +5V regulator
Q1	2N2222 or similar (BC548 etc)
D1	1N4004 or similar power diode

Miscellaneous

XTAL1	17.734MHz crystal (see text)
L1	10uH RF choke
J1	DB25M PCB-mount connector

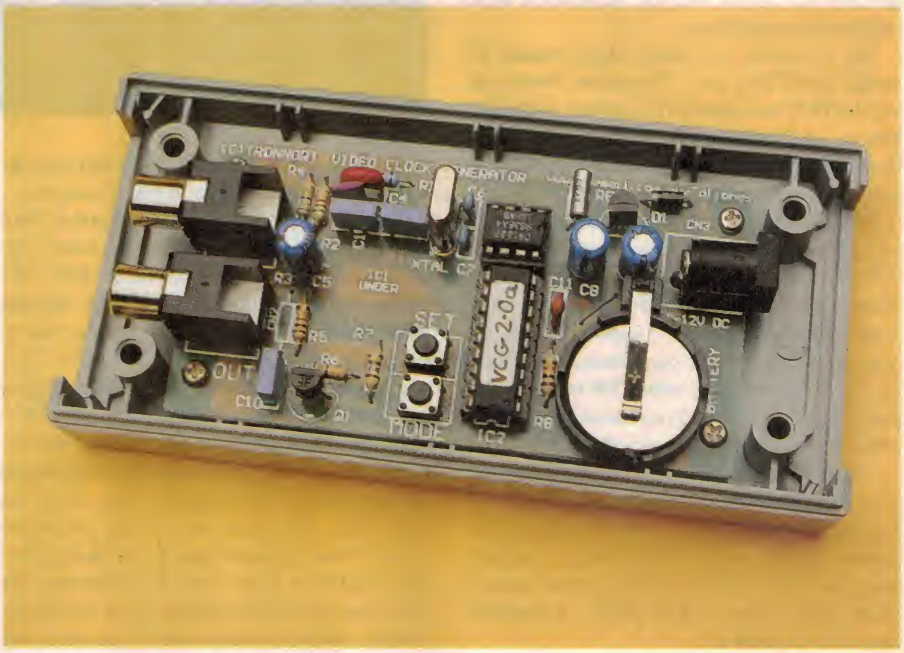
PCB, 96 x 80mm coded 990sd8; PCB terminal pins (7); connecting wires for DC power and video input/output, etc.

Construction Project

Low Cost Video Clock/Message Generator

Here's the second of our on-screen video display projects based on the SGS-Thomson STV5730A chip. In this case it's a very compact unit which overlays the time, date and a short message on an existing video image — great for security monitoring and similar dedicated applications!

BY DAVID L. JONES



WITH THE PROLIFERATION of cheap CCD camera modules today, it's now easier and cheaper than ever to set up your own video camera system. There are an endless number of applications such as security monitoring in a shop or other area, process monitoring in a factory or laboratory, amateur CCTV transmission, or even a fancy video doorbell to name just a few.

Whilst it is all very well to be able to display and record a video signal from a camera, in many cases it is also necessary to know *when* the image was recorded — in fact it's essential for video security and other unattended applications. This is typically done by overlaying the time and date information onto the video image itself.

But how do you go about doing this? You can either purchase an expensive video switcher or VCR that has this facility built in, or you can build your own with the simple and low cost design to be described here!

The following design is capable of overlaying the time and date onto any existing PAL (or optionally NTSC) composite video signal. It is housed in a very neat and compact standard moulded casing and has standard 75Ω RCA video inputs and outputs. A single +9V to +15V DC supply is used to power the device, which can be taken from an existing camera supply if desired. As a bonus the design is also capable of displaying a 10-character user defined text 'message' along with the time and date.

Two on-board pushbuttons are used to set the time/date and text message, and a 3V lithium backup battery is provided on board to maintain the time and date in the absence of power.

Circuit overview

As you can see from the accompanying photos and schematic the design is extremely simple — just three IC's, a few passive components and not much else!

For those who are familiar with video signals and the complexities involved in dealing with them, you may already be wondering just *how* this design can do what is claimed, with just three IC's! Normally a design such as this would require sync separators, phase-locked loops, horizontal and vertical timers, and that's before you even get to generating the text on the screen!

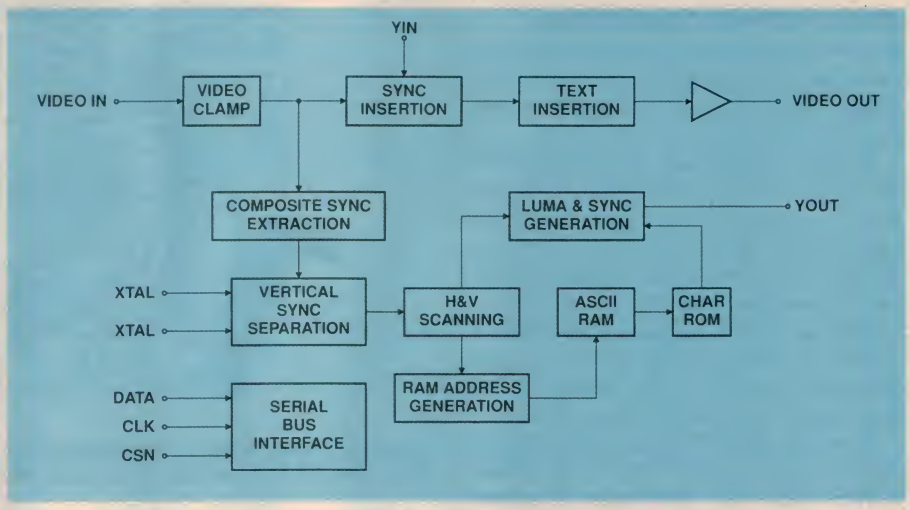
The secret of this design lies in IC1 (STV5730A), a 28-pin surface mount on-screen display generator chip manufactured by SGS-Thomson. This chip contains a complete system that takes an incoming video signal and can overlay text anywhere onto the video image. It contains an ASCII character generator ROM, video timing generator, vertical sync separator, PLL, voltage reference generators, video clamps, and more! Quite a lot for one chip, but such integration is required to reduce costs in today's digital TVs and Pay TV set-top boxes, which is clearly the kind of application the chip is designed for.

IC1 has many different modes and features that are not used in this design and consequently will not be discussed here. Basically all that the STV5730A requires to generate text onto a video image is a controller to tell it what needs to be displayed, and where.

IC2 is a microcontroller which tells IC1 what to display, along with setup and configuration commands. The time and date is maintained by IC3, the DS1307 — a low power clock/calendar chip manufactured by Dallas Semiconductor. This chip contains a complete 12/24 hour clock and calendar that automatically maintains the time and date in the absence of power, by virtue of the 3V lithium battery. IC2 basically reads the time/date from IC3 and sends the information to IC1, to be displayed on the screen.

Now let's take a look at each chip in a bit more detail.

Right: A simplified block diagram for the STV5730A on-screen display generator chip which forms the heart of the project



STV5730A operation

The basic internal operation of IC1 is shown in the accompanying diagram in block form. The composite video input is first terminated by R4 (75Ω) and then AC coupled by C5 directly into IC1. This signal is then clamped and the composite sync signal is extracted. The input AC coupling and clamp are required in order for IC1 to able to operate off a single +5V DC supply.

The extracted sync signal controls the timing of the vertical sync generator, along with the external crystal. This crystal must be 17.734MHz for PAL signals and 14.318MHz for NTSC (i.e., four times the colour subcarrier frequency, in each case). These timing signals are then fed into the horizontal and vertical scanning logic, which drives the RAM address generator.

The RAM address generator selects a character to be displayed from the internal user definable character RAM, which points to a character in the character generator ROM. This ROM data then controls the luma and sync generation section (YOUT) which feeds the sync insertion and text insertion logic (via YIN). The final video signal with the text overlay emerges from the text insertion section and is buffered and passed to the video output.

The video output is then fed into the emitter follower circuit of Q1 which drives the 75Ω output.

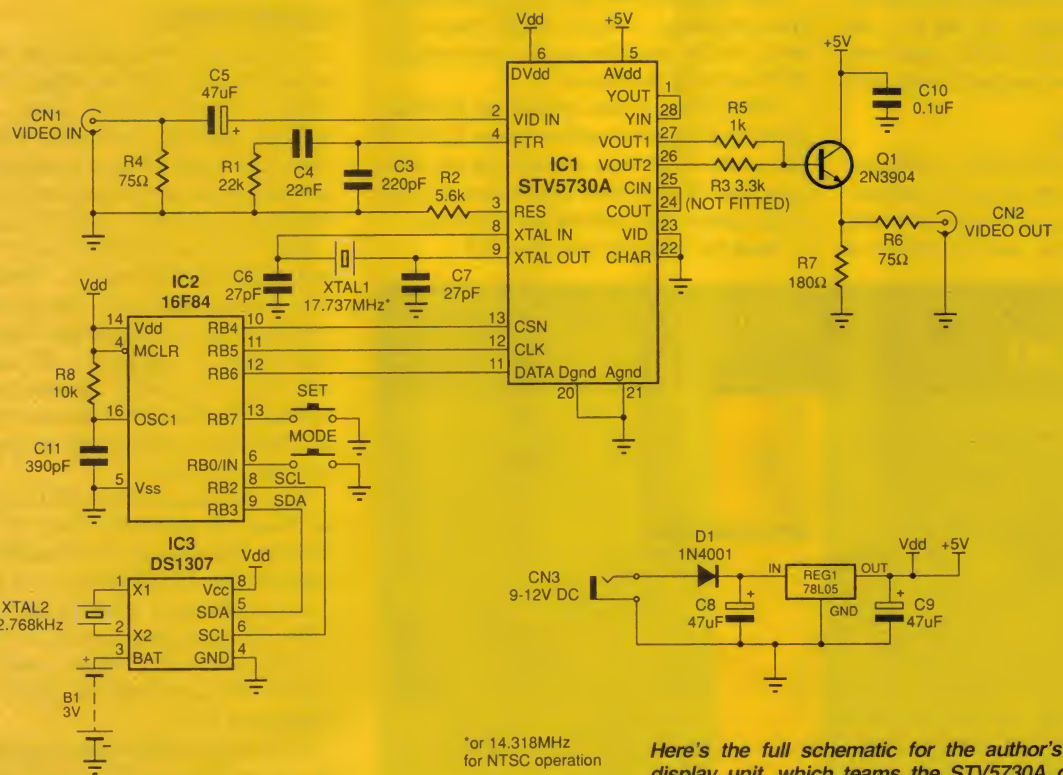
Because the output is 75Ω impedance, if the internal gain of IC1 was set to 0dB then the output would be 6dB down when terminated into a 75Ω load. To allow for this attenuation the internal gain of IC1 is set to +6dB by the software in IC2, when the circuit is first powered up.

The network of R1, C4 and C3 is used for the internal PLL loop.

The character brightness can be controlled via an external voltage or generated internally. In this application the brightness is controlled internally and is set to approximately 75% of the white level.

Characters can also have 'attributes', such as blinking and a black border. These are disabled in this project's software however, as the on-screen display is designed here to be as unobtrusive as possible.

IC1 requires separate analog and digital supply and ground lines and as you will see on the PCB these have been kept separate to reduce coupling of noise from the digital supply into the analog section.



*or 14.318MHz for NTSC operation

Here's the full schematic for the author's clock and message display unit, which teams the STV5730A chip (IC1) with a pre-programmed microcontroller (IC2) and a clock/calendar chip (IC3).

Low Cost Video Clock/Message Generator

Clock/calendar operation

IC3 is a clock/calendar chip that maintains both time and date in BCD format. This information is read from and written to the chip via an I²C (Inter IC Control) two-wire bus.

The I²C bus uses two open-collector TTL lines: SCL (clock) and SDA (data). An I²C bus contains a master and a slave, and in this case the microcontroller IC2 is the master while IC3 is the slave. The master initiates all data transfer to and from the slave, using the two control lines.

Because the I²C bus is an open-collector system, the SDA line can be used to send data both to and from the slave. IC2 has internal pull-up resistors on these lines.

IC3 stores the BCD time and date information in registers, in the form of an internal memory map. This information is updated automatically once every second. IC2 can read this data by selecting an internal register and reading the contents out. The fact that the data is in BCD format is very convenient in this application, as IC2 does not have to do any decoding or calculation of the time/date information — just send it on to IC1 to be displayed.

IC3 contains a power-fail-detect circuit that automatically switches the internal supply over to the 3V backup battery when the supply rail gets to a low threshold. In battery backup mode the chip only requires microamps of current to keep the clock going. Thus the backup battery will last almost the shelf life of the battery.

The DS1307 chip also has 56 bytes of battery-backed RAM that can be used for data storage. Here we use this memory to store the user defined text message. By the way the chip is fully Year 2000 (Y2K) compliant, with correct rollover and leap year correction.

Main operation

IC2 is a PIC16C558 8-bit RISC microcontroller. It has 2KB of one-time-programmable instruction memory, 128 bytes of RAM, 13 bidirectional I/O lines, and can operate at up to 20MHz. Many will be familiar with the popular PIC16F84 chip; the 16C558 is a pin-for-pin compatible chip that has more memory, but lacks the EEPROM data storage of the 16F84. In fact the 16F84 can be used in this circuit because the code is less than 1KB and can thus fit into the 16F84. However the 16C558 is about half the cost of the 16F84...

I actually used a 16F84 to develop the firmware. The discontinued 16C61 can also be used.

IC2 uses an RC clock oscillator formed by R8 and C11, which runs at approximately 1MHz. There is no critical timing involved in the software, so an RC oscillator was a cheaper solution than a crystal.

The controller uses seven I/O lines to control everything — two for the I²C bus to IC3, three for the interface to IC1, and two for PCB mounted pushbuttons.

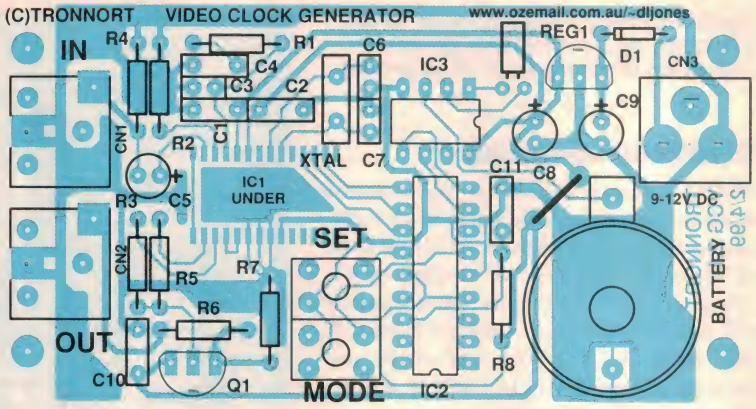
When power is first applied, the firmware resets and initialises various modes in IC1. It then retrieves the time, date and last text message from IC3. A main loop is then continuously executed, to perform the following:

1. Read the time and date from IC3
2. Send time, date, and message information to IC3
3. Check for pushbutton operation

The software continues in this loop indefinitely, updating the display many times per second.

If the MODE pushbutton is pressed, then the software will enter an Edit mode that will stop updating of the on-screen clock. The MODE button will move the cursor and the SET button will increment the data. After making your changes, pressing MODE and SET will return the software to the main loop.

REG1 is a simple +5V voltage regulator. The circuit will take less than 50mA, which is well within the 100mA capability of the regulator.



Use this overlay diagram as a guide when you're fitting the components to your PCB. Note that IC1 is a surface-mount chip, which mounts under the PCB on the copper side.

Construction

As you can see from the photo, the circuit is all on one compact PCB measuring 88 x 48mm, which is housed directly into a compact moulded enclosure measuring 120 x 60 x 30mm. All of the external connectors, battery and pushbuttons are mounted on the PCB and therefore no off-board wiring is required.

The PCB mounts directly into the case on four moulded PCB mounts. Overall it's a very elegant solution, that provides the utmost of ease in construction. Note that the PCB pattern is copyright to the author, and will only be available commercially from Tronnort Technology or licensed kit suppliers. Individual constructors are free to etch their own, however.

Start construction of the PCB by inspecting the board for shorts and other problems — although all PCB's supplied should be solder masked so this will generally not be a problem.

You should start with IC1 first, the most difficult component to mount, as it is harder to solder once all the other components are in place. Be sure to take the usual anti-static precautions first.

IC1 is a 28-pin SO surface mount IC package, mounted on the solder side of the PCB. If you haven't done any surface mount soldering before, then this will be a new challenge. You

Parts list

Semiconductors

IC1	STV5730A on-screen display chip (SO-28)
IC2	Programmed PIC16C61-04P (Tronnort)
IC3	DS1307 clock/calendar chip
REG1	78L05 5V regulator
D1	1N4001 diode
Q1	2N3904 NPN transistor

Resistors

R1	22k 0.25W
R2	5.6k 0.25W
R4,6	75Ω 0.25W
R5	1k 0.25W
R7	180Ω 0.25W
R8	10k 0.25W

Capacitors

C1,2,10	0.1uF MKT
C3	220pF ceramic
C4	22nF MKT
C5,8,9	47uF 16VW RB electro
C6,7	27pF ceramic
C11	390pF ceramic

Miscellaneous

1	PCB, 85 x 47mm, code VCG2.1
1	Plastic utility case, 120 x 60 x 30mm
1	32.768kHz watch crystal (X2)
1	17.734MHz crystal, HC-49 package (X1)
2	PCB mount pushbutton switch
2	RCA connector, PCB mount 90°
1	2.1mm DC power connector, PCB mount
1	Button cell battery holder, PCB mount
1	Lithium 2016 or 2032 button cell

Two examples of the display produced by the project — just the shot for continuous 'time and date stamping' of video for surveillance work.

will need a fine tipped temperature controlled soldering iron and 0.56mm or finer solder. You can get away with 0.71mm solder, but the finer solder produces a much better result.

Soldering surface mount ICs is relatively easy if you follow a few simple rules. First of all locate pin 1 on the PCB — it will be marked with a small '1'. Apply some solder to this pad to form a small bulge; this is to aid in holding the chip in place. Now locate pin 1 on the chip, and align it with the pretinned pin 1 pad on the PCB, before applying the point of the iron. The pin should sink down onto the pad and hold the chip in place.

Ensure that the chip is centred on the other pads; if not, then re-heat pin 1 and gently move the chip until it's centred. You can now solder the other pads — starting with pin 15, which will hold the other corner of the chip in place. This is done like soldering a normal joint, except that you will apply far less solder.

Unless you are experienced, do not solder all of the pins one after the other, as the chip may get overly hot and possibly get damaged. After every few pins stop and feel the chip; if it is too hot to touch, then let it cool down before continuing — there's no rush. One of the major causes of surface mount component failure is excess heat, so be careful!

Do one final check to ensure that there are no solder bridges between pins, before you proceed. Use a magnifying glass if needed.

Due to the small number of components, the mounting order for the other components is not important, but it is recommended to leave the high profile components such as the RCA connectors until last. An IC socket should be used for IC2, as this chip contains firmware and thus may be updated at a later stage. Ensure the correct orientation of polarised components and don't forget the wire link near the battery. Use the component overlay as a guide.

Do not solder the battery holder to the board with the battery in place; remove it first. Also take care with the watch crystal, as it can be easily damaged by excess heat.

Also, don't mount the PCB into the case until it has been tested.

Testing & operation

There is essentially no testing or setup to be done; the circuit should work first time.

Insert a 3V CR2016/2032 lithium battery into the battery holder, positive side up — being careful not to short it on the spring loaded connector.

Now connect a video source to the input (camera, VCR, video generator, etc) and a monitor (VCR, security monitor etc) to the output. Apply power to the board and you should immediately see a time and date display at the top of the screen. The clock may or may not be updating at this time, but this is not a problem.

The time, date and text message will obviously be wrong, so the first thing to do is set them correctly. This is done by pressing the MODE button to enter edit mode. The clock will stop updating on the screen and a cursor will appear under the first character. Pressing the SET button will increment the character under the cursor. The MODE button will increment the cursor by one character place.

Continue moving the cursor and changing the characters until the desired information is set. Note that the time will not be updated until after you exit edit mode, so if you want the time to be very accurate then set it for a few minutes ahead of time and then wait until the correct time to exit.

To exit edit mode, press and hold down the MODE button and quickly press the SET button at the same time. The cursor should disappear and the time/date/message information will be written to the clock chip, whereupon the display will start updating as normal. Now disconnect and reapply power to the unit, and ensure that the time/date and message show up again as expected.

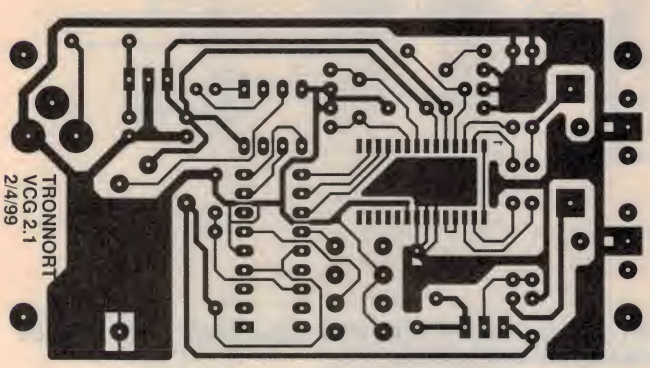
That is all there is to the operation of the unit. The time will be incremented once every second, and the information will be retained when the power is disconnected.

All that is left now is to connect it into your desired system, which will usually be just before the VCR or monitor input.

The time and date are fixed in 24hr and DD/MM/YY format respectively and the display is fixed at the top centre of the screen.

A complete kit with all components including the programmed PIC chip will be available, as well as individual programmed chips for those who wish to build their own customised unit. Further information is available from the author's web site at **http://www.ozemail.com.au/~dljones**, or by e-mail to **dljones@ozemail.com.au**. Readers can also contact the author if an NTSC version is required.

Happy recording! ❖



Here's the PCB artwork, reproduced actual size to allow individuals to etch their own. But note that commercial copyright is held by the author, and boards may only be available from a nominated kit supplier.

Digital timer enhancement

With a little ingenuity, reader Cliff Davis has come up with a simple and effective enhancement that will allow a standard LCD clock/timer to control anything from a simple alarm to a 240V mains rated appliance. In addressing the problem in such a simple and effective way, Cliff has come up with an add-on circuit that provides both a user-friendly interface, and a cheap and practical design.

BY CLIFF DAVIS

A situation arose recently when I was asked if I could knock up some sort of timer/switch unit that would be able to cover periods from a few minutes to several hours. It was to be used to control an ultra-violet radiation machine, as the expensive timer supplied with the device had failed and they were desperate to get the machine up and running as quickly as possible. My first thought was to purchase a photo enlarger timer, but these unfortunately turned out to be fairly expensive products. As the timer was only to be used as a temporary device I decided to look for another alternative.

Although a kit type timer could have been used, none of them had a display showing the time remaining, and weren't terribly user friendly when it came to varying the set and reset timing periods.

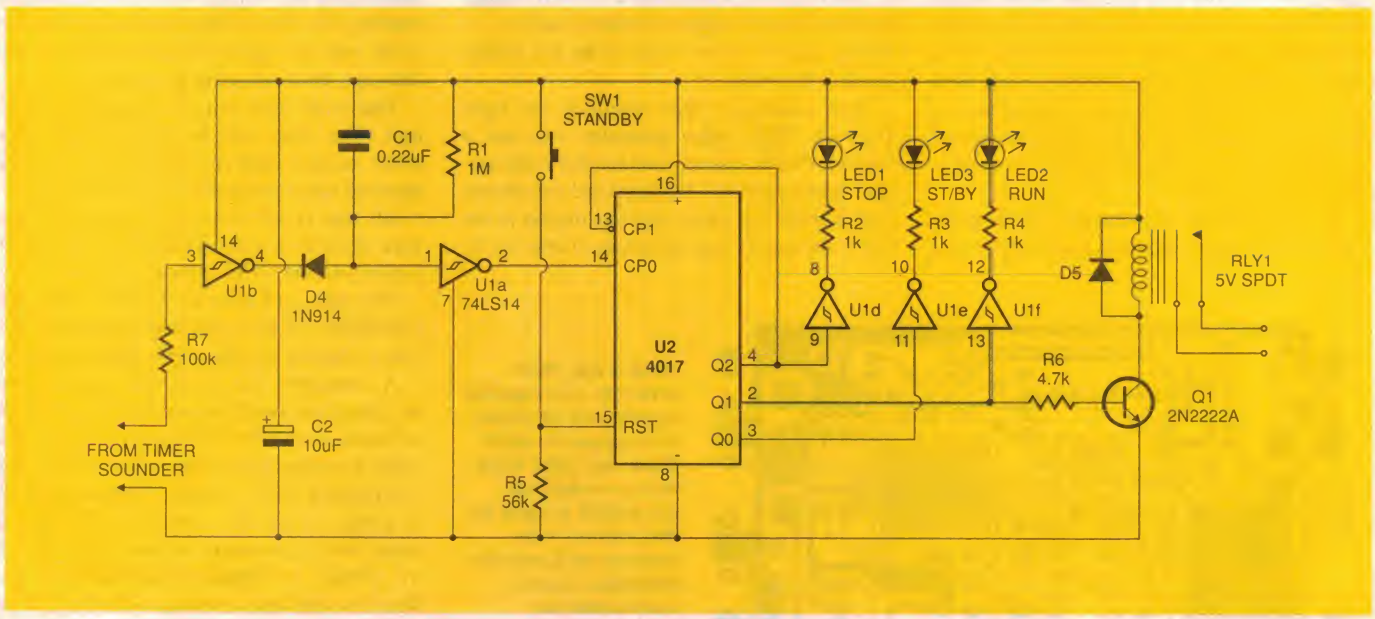
Looking for a way around this dilemma, I came across a laboratory type 24-hr timer clock which could be set from seconds to 24 hours simply by pressing a few front panel buttons. An added feature was a memory facility for setting up a preset timing period. This timer was purchased from Dick Smith Electronics (Cat. No. Y-1023), priced at $19.95. While I decided to use this particular unit, the circuit shown here can be used with just about any readily available digital timer with a piezo output.

Dancing pulses

Now comes the fun part! The problem with this type of device is that it's only designed to carry out specific functions and makes no provision for any added attachments. Anyone who has pulled apart a hand-held calculator or devices of this nature are soon brought back to earth when they are confronted with a very thin circuit board and an LSI device hidden under a blob of epoxy resin.

Even if you manage to attach your oscilloscope probes to the IC, you are confronted with a dazzling array of pulses dancing around that don't seem to relate to any of the device's more obvious functions.

Fortunately, this particular timer produces a short beep each time a function button is pressed. This short tone burst is supplied to a small 10-to-1 step up transformer that supplies a 10 volt tone signal to the piezo-electric transducer. As the tone bursts are exactly the same for each function, the trick is to develop a circuit that will recognize a correct sequence of tones and activate a relay. The following circuit, which is made up of a few inexpensive components, achieves this aim.



The beep signal from the timer unit is buffered by U1b, integrated by C1, and then used to clock U2 once per beep. The three LEDs show the status of the counter, with transistor Q1 operating the relay during the timing period.

Circuit description

The circuit is centred around the CD4017 Johnson decade counter IC, U2. A 74LS14 Hex Schmitt Trigger IC (U1) is used for the circuit's input signal conditioning and the LED buffers. The whole circuit is supplied from a 6V plug pack, while the LCD timer runs off its own 1.5V battery.

The 10V tone bursts from the timer are tapped off from the piezo's connection points, and sent to our circuit via R7 to pin 3 of U1b. U1b acts as a high impedance buffer which won't load the signal to the piezo. The first negative portion of the tone burst signal at U1b's output charges C1 via D4. The input of U1a will swing low and remain at ground potential for the duration of the tone burst, due to the blocking action of D4 and the time constant of R1/C1.

As U1a's input swings low, its output swings high, clocking the counter one step. At the end of the tone burst R1 will discharge C1, and U1a's output will return low. By 'slugging' the input signal in this way, U1a is prevented from clocking the counter on every cycle of the tone burst.

We will assume the counter is sitting in the stop mode, and so the Q2 output of U2 is high. As this pin is connected to the clock enable input (pin 13) of U2, the clock input is inhibited. In this condition any tone burst signals arriving from the timer have no influence on U2, therefore the circuit remains in the stop mode. With the circuit set in this mode the operator can carry out the necessary timer settings.

When the timer is set, and before pressing its start button, the circuit's standby button must be pressed. This action places a high level on the counter's reset pin, thus placing Q0 (pin 3) of U2 in the high state. This action turns on the ST/BY LED, and sets the circuit up in standby mode.

When the start button on the timer is pressed, the tone burst signal advances U2 one count, bringing its Q1 output high. This turns on the RUN LED, and activates the relay RLY1 via Q1. At the end of the timing sequence, or if the stop button is pressed, the tone burst signal once more steps U2 on to the stop position turning the STOP LED on and turning the relay off, then the whole procedure can start over again.

Construction

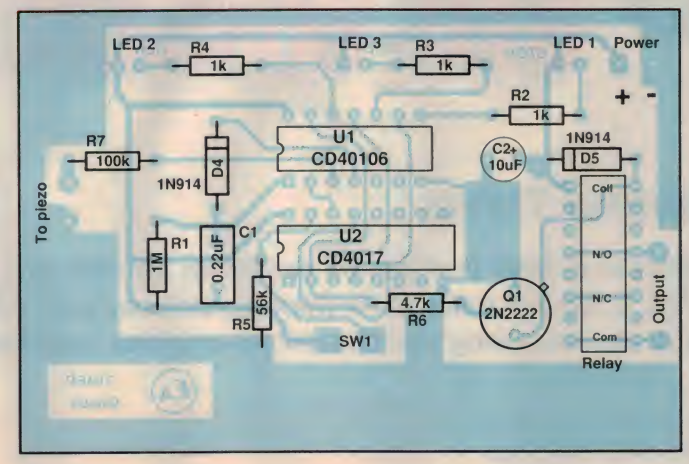
Construction is very straightforward, with all the parts mounted on a single PCB labeled 98te08. Install the seven resistors, the two capacitors, the diodes and the transistor first, followed by the two ICs and finally the relay.

The timer unit was mounted on the front of a hand held instrument case which incorporated a battery compartment. Wires were then run from the timer, through appropriately placed holes to a 1.5V battery situated in the battery compartment. This allows the timer to be programmed and its battery replaced without having to dismantle the unit.

With the timer mounted on the front panel, run wires from its piezo transducer contacts to the two pads on the board.

Drill the appropriate holes through the top of the instrument case just below the timer unit to allow for the positioning of the LEDs and the pushbutton stand/by switch. Provision should be made at the side of the instrument case to accommodate the plug pack power supply and the relay output sockets, and these can be wired up now.

All that remains is to mount each of the LEDs and the pushbutton in the front panel, and connect them up to the board.



Use this component overlay diagram as a guide when installing the components. Double check the orientation of U1, U2, Q1, the two diodes and the relay.

PARTS LIST

Resistors

R1	1M
R2,3,4	1k
R5	56k
R6	4.7k
R7	100k

Capacitors

C1	0.22uF MKT
C2	10uF 16WV electrolytic

Semiconductors

U1	CD40106 (or 74C14) hex schmitt inverter
U2	CD4017 CMOS decade counter
Q1	2N2222 or BC338 switching transistor
D4,5	1N914 or equivalent silicon diode
LED1-3	5mm Red LEDs

Miscellaneous

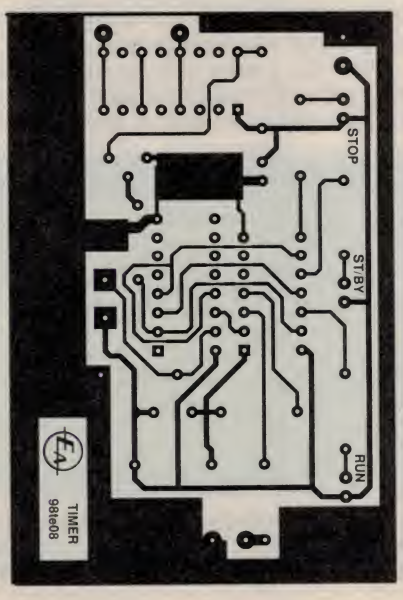
PCB 76 x 51mm, coded 98te08; LCD timer unit with piezo output (DSE Y-1023 or similar); plastic case; 6V relay; 6V plugpack; hookup wire, solder etc.

Safety note

A quick but important note on safety: I do not recommend that a 240V mains powered application be switched directly using this type of arrangement. I strongly recommend the board mounted relay switches only low voltage applications.

If mains operated devices are to be used, then switch them through a low coil voltage relay with 240V contact ratings mounted within the 240V application — or use an appropriate high isolation opto-coupled Triac driver, such as the Z-4516 3021 optocoupler from Dick Smith Electronics. A circuit description of this device is given on page 245 of the Dick Smith Electronics Catalog. By connecting a wire jumper between pins 1 and 8 of the relay, and a 330 ohm resistor between pins 16 and 13, you'll be able to source sufficient current to drive the LED incorporated in the optocoupler.

I haven't provided too much in the way of construction details or modifications to this project, as the methods, materials and construction technique will depend on your application. ❖



Use this PCB artwork if you're making your own PC board. It's reproduced here full size.

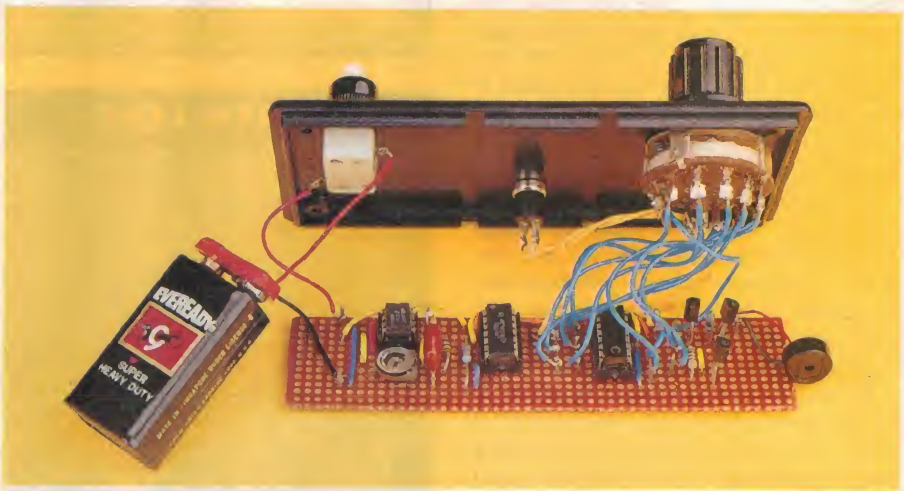
$10 WONDERS

26 — A Tuneful Timer

This month's project is a timer that can be set to run for different lengths of time, and at the end of its timing period, it plays a tune! It's a friendly, informal kind of timer, warning you a little before your time is up, and giving you time to get your act together before it cuts off.

This $10 Wonder has obvious applications for timing telephone calls, boiling eggs (and other branches of cookery), and any other situation in which to-the-nearest-second timing is inappropriate.

Unlike practically all the previous projects in this series, this one does tend to cost rather more than our usual ten-dollar limit. Fortunately, there are ways of saving a few dollars by cutting down on the specification. We will mention some of these later. But we thought that readers might like to see the fully worked out design, which provides a useful selection of timing options.



How it works

Timing is provided by the 7555 timer (IC1 in Fig.1) wired as an astable multivibrator. The frequency of this oscillator is adjusted to 4.267Hz by setting trimpot VR1. The next stage in the circuit is a divide-by-128 counter (IC2) which reduces the frequency to 4.267/128, which is 0.0333Hz. The period of a 0.0333Hz signal is 1/0.0333, which is 30 seconds. Hopefully now we see the reason for the rather unusual frequency that the 7555 oscillator generates.

The output from IC2 goes high, then low and back high again, once every 30 seconds. As it changes from low to high, the decade counter IC3 is advanced by one count. IC3 has 10 outputs, which are normally all low excepting for one, which is high.

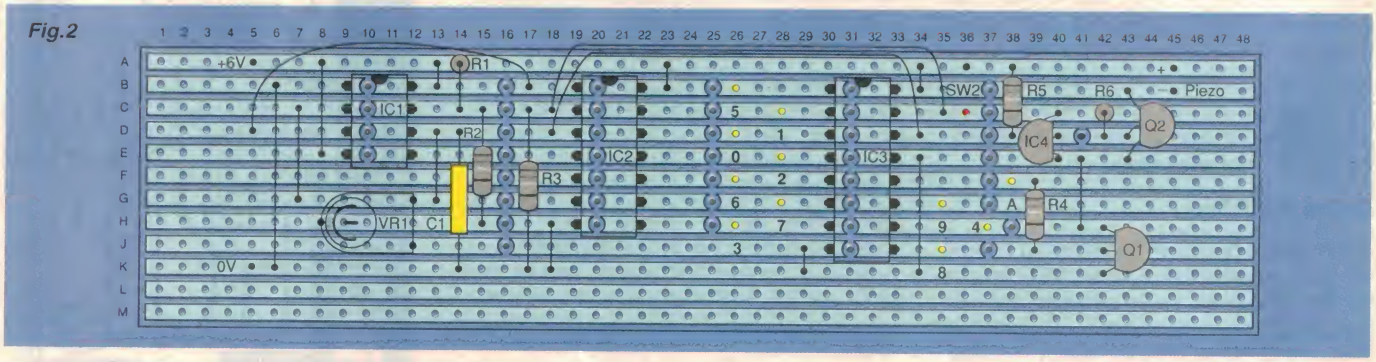
When the counter is reset (by pressing SW2, pulling IC3's RST pin high), output 0 of IC3 goes high. Counting is enabled when SW2 is released. Output 1 goes high on the next positive-going edge from IC2, which is actually 15 seconds after SW2 is released. (Notice that SW2 also resets IC2, so both counters always start from zero.) IC3 is then incremented every 30 seconds after that, causing each of the nine outputs to go high in turn.

The rotary switch SW3 selects one of these outputs, and when that particular output goes high it turns on Q1. This transistor acts as a switch, which controls the UM66 melody generator IC4 — which looks just like an ordinary three-legged transistor.

The UM66 produces a musical signal on pin 1 when a voltage is applied across pins 2 and 3. This musical signal is amplified by Q2 and the sound comes from the mini piezo transducer. Resistor R5 is there to drop the supply voltage to the music IC, because IC4 should not have more than 3V across it.

Note that there are several kinds of small piezo device marketed and they all have similar appearances. One type is the piezo alarm or siren, which has built-in circuitry to produce a high-frequency note. Some have a two-tone output, and might be better described as piezo buzzers. These are NOT the types to be used this project. We need a *piezo sounder*, sometimes called a piezo transducer or an audio transducer. It has no built-in oscillator so you have to provide the audio signal yourself — and in this project it comes from IC4.

Fig.2



In the photo (top) you can see the Tuneful Timer out of its box, showing how the rotary switch is wired to the board. The overlay above shows the various switch connections around IC2. In the schematic (far right), IC1 is a free-running oscillator, with IC2 clocking IC3 once every 30 seconds. The selected output from IC3 switches on the music IC via Q1 when the timing period is nearly over.

BY OWEN BISHOP

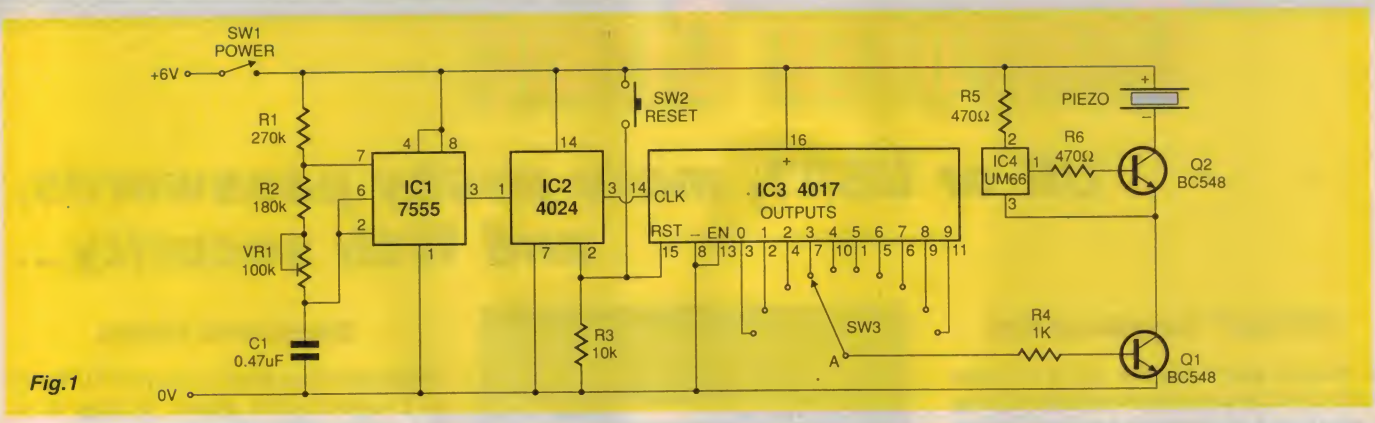


Fig.1

Instead of a piezo sounder you can use an electromagnetic transducer (which is a very small loudspeaker) or even an ordinary loudspeaker, if you like better quality sound and have space to spare. If the speaker has a low resistance coil, say 32Ω or less, wire a resistor in series with it to bring the total resistance of speaker and resistor to about 30Ω. If you have an old radio receiver in your junk box you could take the speaker from this to save costs.

There are several different versions of the UM66, each with a different tune. The one in our prototype plays Beethoven's *Fur Elise*. If this is not to your taste you can pick from a range including *Love Me Tender* and *Mary had a Little Lamb*!

Just a few words about the timing sequence. If you switch to output 0 and press reset (SW2), you'll hear the tune for 15 seconds. This position is useful for testing that the timer and audio circuits are working. In position 1 there is silence for 15 seconds after pressing SW2, then the tune plays for 30 seconds. From positions 2 to 9 the silent period increases by 30 seconds at each step. So position 9 gives a delay of four and half minutes followed by 30 seconds of sound.

The best way to think about this is that the positions 1 to 9 give periods reckoned in half-minutes, but the tune starts 15 seconds before the end of the timing period (and lasts for 30 seconds).

If you let the time continue to run, it repeats the tune every 5 minutes, whatever the setting of SW3. This is why we call this an 'informal' timer. It tells you when the steak is *likely* to be done but leaves *you* to judge the precise moment to take it off the barbie.

Construction

The circuit runs on 6V, provided by four AA cells in a battery holder. A PP3-type clip is used to connect this to the circuit. SW1 can be an SPST switch, and for this we found a cheap push-on/push-off lamp switch in the spares box.

The circuit is built on a rectangle of stripboard (Fig.2) cut to fit into the plastic Jiffy box. We have left the ends of the board clear of components so that you can cut it shorter to fit into a smaller box, if required. If you want to save cost you do not need the box, and you can manage without SW1. Simply snap the clip on to the battery holder whenever you want to run the timer.

Assemble the timing circuit first. If you have a multimeter with a frequency-measuring facility, this is ideal for setting the frequency. Set it for 4.267Hz. Otherwise it can be set later. Note that C1 is a polyester capacitor; an electrolytic one does not give the stability required for a timer.

The values shown in Fig.2 are for a timer with a 30-second period. You might prefer to have one-minute periods, in which case change C1 to a 1uF and reduce R1 to 220k. You will then have to set the frequency of the oscillator to 2.133Hz.

Next add IC2 to the circuit and confirm that the output from pin 3 has a period of 30 seconds. If you hadn't adjusted the timing earlier, you can do it now by monitoring one of the outputs of IC2. The output at pin 5 should have a period of 7.5 seconds. It doesn't take long to adjust VR1 to bring it close to this value, after which it can be fine-tuned by adjusting VR1 while monitoring the output from pin 3.

When you have added IC3 to the circuit, check that its outputs run through the correct sequence (each high for 30 seconds in turn, repeating). At this stage the outputs are monitored by touching a test probe to the terminal pins marked 0 to 9 in Fig.2. Do not wire in SW3 at present.

Build the audio sub-circuit, noting that the flat surface of IC4 faces right but the flat surfaces of Q1 and Q2 face left. Wire the piezo sounder to its terminal pins and temporarily connect the input pin (the top end of R4, in Fig.2) to +6V. The melody should play repeatedly. If it does not play properly — for example, it emits a sequence of clicks but no tones — it is likely that the voltage across pins 2 and 3 is too high. If it is appreciably more than 3V, replace R5 with a resistor of higher value.

A rotary switch makes an ideal device for selecting the time, but such hardware always adds a relatively large amount to the project cost. You may have a suitable switch in your spares box, but you could make do with a 2-pole 6-position switch if you can not find a 1-pole 12-position one. Of course, in this case you would only have six timing periods to choose from. For lowest cost when the circuit is not enclosed in a box, you can dispense with the rotary switch altogether. Solder a short flying lead to the pin at the top end of R4 and terminate the lead with a crocodile clip. You can then select the various timing periods by clipping the lead to one of the output pins around IC3.

The prototype was mounted in a small Jiffy box, with the board in one of the internal slots and most of the off-board components mounted on the lid. We could have mounted the piezo sounder on the lid too, but decided to glue it to the end wall of the box instead. We had previously drilled a 3mm hole in the wall to let the sound escape.

To complete the project slot the board into position, glue the sounder to the inside of the box and screw down the lid. Fit a pointer knob (or one with an index line or dot on it) to SW3. The positions of SW3 can be labelled with stick-on tape labels. A simpler technique is to punch small discs from insulating tape of various colours and stick these around the knob.❖

Parts List

Resistors

(all 5%, 0.25W)

R1	270k
R2	180k
R3	10k
R4	1k
R5, R6	470 ohms

Capacitors

C1	0.47uF MKT or polyester

Semiconductors

IC1	7555 CMOS timer
IC2	4024 7-stage counter/divider
IC3	4017 divide-by-10 counter with 1-of-10 outputs
IC4	UM66 melody generator
Q1, Q2	BC548 NPN transistor

Miscellaneous

SW1	SPST switch
SW2	Push-to-make pushbutton
SW3	12 way rotary switch (see text)

Stripboard 32 x 125mm (12 strips x 48 holes); 17 x 1mm terminal pins; mini piezo sounder; 8-pin IC socket, 14-pin IC socket, 16-pin IC socket, battery holder (4 x AA cells), PP3 battery clip, Jiffy box approx. 130 x 68 x 45mm; knob for SW3.

COMPUTER CLINIC

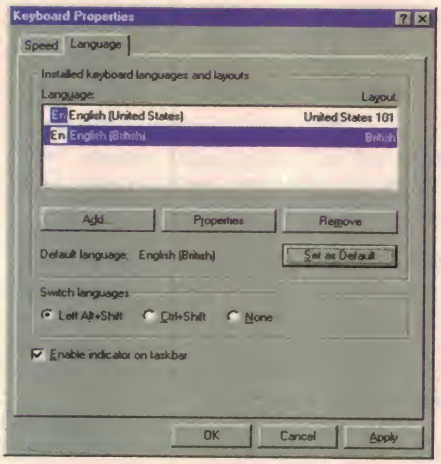
UK or USA?, more pesky passwords, and Web security...

#$%&* keyboards!

A friend's new computer has a problem with six of the keystroke functions. Hitting \ produces #, # produces a pound sign, @ and " have interchanged. (It is a big problem not being able to type '\'...) This is only in Windows (98) applications; DOS is OK. I can't find anything in Windows Help to fix it. Any suggestions would be welcome please. (Ross Davidson, Wooloowin Qld.)

Simple! Your Windows has the British keyboard layout installed, instead of the American one that you need. To fix this, go to Control Panel | Keyboard -> Language, select English (United States), and hit Set Default.

If the US layout is not in the list, you'll need to install it. Click the Add button, select English (United States) from the list and hit OK. I recommend you remove the British layout altogether, as this will avoid all the confusion in future.



Password forgotten

Can you explain how to convince my computer to remember my password to connect to my Internet service provider? Ticking the box just doesn't work. Both my private machine and the one at work have developed amnesia. I think it was when I shifted to PNG and changed to a new service provider here that mine stopped remembering. And as for the one at work, I think a visitor wanted to check his e-mail back in the US a couple of months ago and that was it for that one.

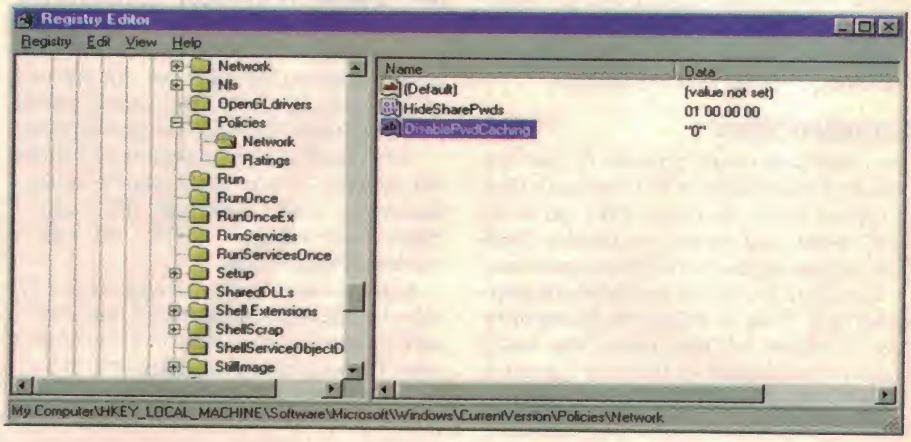
It's just a pain, that's all, as we both have long or hard to type passwords and security just isn't an issue. Both are running Win95. Remember the good old days when we had software support for problems like this? Thanks for your support via EA. (David Millist, by email)

I covered a similar case in the July 98 issue of EA, where I recommended installing the Client for Microsoft Networks to enable password caching. If you have the client installed, and passwords still won't save, here are some more things to try:

Ensure that you are correctly logged on to Microsoft Networking. If you cancel the initial Enter Password dialogue, then you won't get password saving for any resources, including Dial-Up Networking.

Your '.PWL' file could be corrupted, so try deleting <your username>.PWL from the C:\WINDOWS directory and rebooting. Next time you logon, your password cache will be blank, but should now work correctly — after the next successful logon, your password should be saved. You might also try deleting the RNA.PWL file (if you have one on your system) while you're at it, as this can also cause problems if it gets mangled.

You can also run Regedit, and take a look at HKEY_LOCAL_MACHINE\Software\Microsoft\Windows\CurrentVersion\Policies\Network\DisablePwdCaching. If this is set to '1', password caching will be disabled. Ensure that it is set to '0', and restart the computer. If the DisablePwdCaching string does not exist, create a new string value, rename it to DisablePwdCaching and give it a value of '0'. Of course, you wouldn't dream of mucking about in the registry if you hadn't backed it up first, would you?



Crossed lines

Please note that there is an error in 'Table 1: Crossover cable pinout' on page 68 of EA, June 1999. The Pinout column of 'Other end (modified)' reading down should be 1,2,3,6. (Ian Horacek, by email)

You are indeed correct, the table as it stands doesn't makes a lot of sense, due to the fact that the last column of the table should not have been there at all.

Fig.1: Crossover cable pinout

	One end (standard)		Other end (modified)	
Pin	Sig.	Colour	Colour	Sig.
1	RX+	White/Green	White/orange	TX+
2	RX-	Green	Orange	TX-
3	TX+	White/orange	White/green	RX+
6	TX-	Orange	Green	RX-

Note that Pin 1 on an RJ-45 connector is on the left, with the cable facing away from you and the locking pin on top.

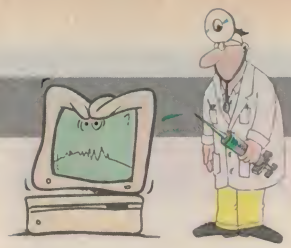
The corrected table is shown in Fig.1. I do apologise for any confusion that this may have caused.

Web security

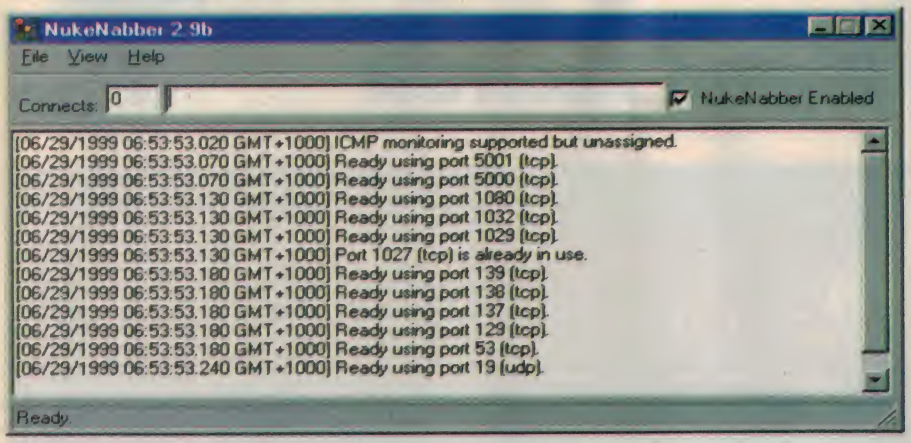
I've received a number of letters recently on internet security and the risks involved in being online, so I'll attempt to cover most of the major issues in one go.

The first thing to look out for is file security — if you have file sharing enabled and bound to your internet connection, then it's possible that others could gain access to your shared drives over the internet. Luckily, this is easy enough to prevent. Go to Control panel | Network, select TCP/IP -> Dial Up

BY JEAN-BAPTISTE CATTLEY



Got any computer queries? Whatever is bugging you, from hardware problems to C programming, send it in and we'll soon have you fixed up. You can email your question to electaus@fpc.com.au, or fax or mail it in to us here at EA.



Adapter (or just TCP/IP if you don't have any other adapters listed), hit Properties, go to the Bindings page and uncheck File and Printer sharing. That way, no matter what comes in the modem, nobody will be rooting through your filesystem. (At least by normal means...)

The second thing you have to worry about on the net are trojans and viruses. (The difference between the two is that viruses replicate by themselves, while trojans can be a direct attack, hidden in a harmless-looking executable.) The simple way to avoid the vast majority of these is to simply avoid running any software that comes from a less-than-reputable source, such as in email attachments from unknown senders, downloads from dodgy-looking websites or files sent to you on Internet Relay Chat (IRC). This last is a serious problem, there are a number of nasty viruses out there that send themselves to everyone in a given channel... Not nice!

As well as the usual viral payloads such as formatting your hard drive and overwriting your files, there are a couple of downright creative trojans out there called Netbus and BackOrifice that give remote users (that's the polite term, anyway) almost complete control over your computer — allowing them to run programs on your machine, edit your registry, upload or download files, and just about anything else. The Netbus client software can even let them control your mouse!

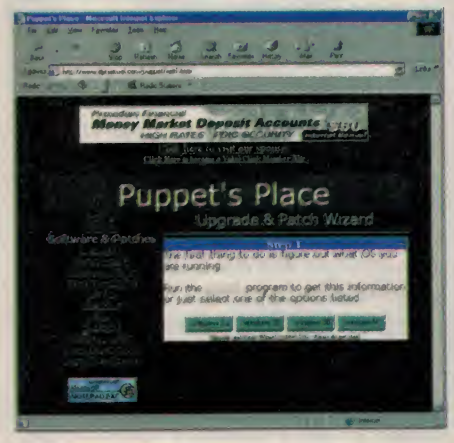
One particularly nasty 'feature' in Netbus is the ability to redirect packets to another address, making them appear to come from the victim's machine — the remote user can do absolutely anything to someone else, and you get the blame... Of course, if you suspect that you might have a trojan, or want to test any programs before you run them, you need some decent antivirus software.

The industry standard virus checker is Norton Antivirus, a commercial product, although they do have a trial version available at **http://www.norton.com/region/reg_ap/product/nav/**. While I'm at it, I'd also like to put in a plug for The Cleaner, another excellent trojan killer, available from **http://www.moosoft.com/intro.php3** . It's US$20 shareware, and it's the one I use. The database is regularly updated, and it's a nice little app that just gets on with the job without clogging up your system. Highly recommended.

The third main form of attack over the net is a Denial of Service attack, also known as Nuking. This highly anti-social activity exploits the rather trusting nature of the TCP/IP protocol suite, and allows sociopathic individuals to disrupt other people's internet connections, or even crash their machines.

Nuke attacks are perhaps most common on IRC, as the IP addresses of victims are easily discovered, and the results are most easily seen. There are a number of different DoS attacks, the majority of which consist of swamping the victim with huge quantities of traffic until their connection seizes up.

The crudest of these is the simple Ping flood, where the attacker simply sends a million Ping requests (a 'respond please' packet, used to determine time lag between two machines) to the victim, swamping their connection both with the requests and the replies that the computer automatically sends. This can cause your machine to lose its connection to the net, or at least drop the useful bandwidth to zero, and take up a significant chunk of CPU time as well.



Perhaps the nastiest form of flooding is known as 'Smurfing', where the attacker sends a ping to the broadcast address of a large network, with the source address of the pings forged to look like the *victim's* IP address. When the ping hits the broadcast address, all the computers on that network respond, each sending their reply to the victim. As you can imagine, up to 255 computers sending a constant stream of ping replies generate enough traffic to bring even the most robust net connection to a standstill. If the attacker pings a large number of networks at once, the resulting flood of ping replies can take down just about anything on the planet.

One different approach to DoS is the WinNuke attack. This exploits a loophole in earlier versions of Win95 and NT, and can cause the whole machine to go down, usually with a 'blue-screen exception error'. What's more, it does all this without requiring any great bandwidth, so any fool with an ordinary dial-up connection can crash your machine.

The attack exploits the fact that Windows doesn't correctly handle the 'Out Of Bandwidth' control message. If it receives a faked OOB message on a listening port, the networking system panics and dies in a screaming heap. This hole was patched in Win98, however, and there is an updated version of Dial-Up Networking and Winsock available that takes care of it for Win95.

You can get both of these updates directly from Microsoft's website, but selecting the correct files for your version of 95 and DUN can be a little tricky, so I suggest you go to **http://www.dynamsol.com/puppet/software.html** and use the Upgrade and Patch wizard. While you're at it, pick yourself up a copy of NukeNabber, a very handy little app that detects a wide range of nuke/flood attempts, and provides detailed logs for tracing purposes.

There's no perfect way to protect yourself against all forms of attack over the net, but if you're serious about protecting your system, you should consider getting a firewall. Firewalls, such as the rather popular Conseal (**http://www.signal9.com**), are designed to very carefully filter all packets coming into a machine, and discard any that are deemed unsuitable before they can do any harm.

Firewalls are a little complex to set up correctly, and can be a bit of a headache to live with, so the average user would need a pretty good reason to bother with them. If your net access is critical, however, or you have sensitive data on a net-connected computer, then you should definitely look into it. ❖

MOFFAT'S MADHOUSE

Tom's New Digital Recorder

A COUPLE OF MONTHS ago when I wrote about the new MP3 computer audio format, I treated the subject as a technical curiosity, made newsworthy mostly by the legal wrangles involving the recording industry and its attempt to banish a little shirt-pocket MP3 file player called Rio. I was interested enough to plop down $200 of my good (US) money for a Rio, thinking it might be useful to get one before they were banned forever by court action. As it turned out, the legal challenge against Rio fizzled out, and the little players suddenly became available (and reviewed in *EA*). The latest ads over here offer them with a $50 mail-in rebate. Tom too anxious to be first! Tom blow money!

Now the Rio, and with it MP3, has hit the mainstream. *Newsweek* reviewed it a while back, displeased because it could only play 'inferior' music which was downloaded from the internet. Apparently they didn't realize that MP3 files could be generated from your own (or other people's) CDs, with the same quality as the original. Prior to MP3, this had been just about impossible. Now even Microsoft has realized that MP3 is more than just a toy. They're talking about including it as a major part of its 'Key Focusing Scenarios' in its next operating system, Windows 2001.

As I've mentioned before, one of my numerous occupations is doing stage sound in auditoriums and halls around the district. I mix the occasional bands, but my real specialty is complex television-style productions.

Beauty pageants are still big in this part of the world. Every year in Port Townsend we have the Rhododendron Festival royalty quest with a queen, princesses, escorts, and junior royalty all strutting their stuff. This is a BIG social event here, strictly black-tie. The royalty candidates march up the aisle of the auditorium, they make impromptu and prepared speeches, they do a talent thing, they get crowned, and they cry. (Even the male ones.)

Nearly every part of the Rhody coronation requires music of some kind. Up until now (this past Rhody was my third year) I relied on a Tascam Mini-Studio tape recorder and a collection of cassettes. Prior to the performance I roughly cued each cassette and then stacked them in the order to be played. As each tape finished I removed it from the Tascam and replaced it with the next, while at the same time using the other hand to run the sound mixer.

This year, thanks to MP3, Rhody entered the computer age. My idea wasn't entirely new. Last year I watched a big church production in Seattle, while sitting right behind the audio operator. Next to the mixer was a laptop computer, and a little squinting and peeking revealed that its screen was displaying a list of .WAV files. The audio op was working through them one by one, right on cue. The audio quality was rather lousy, which suggested to me that the .WAV files had been sampled at a mediocre rate in order to retain reasonable file sizes.

I didn't think the sound quality was good enough, so I didn't pursue *that* idea for myself. That is, until MP3 came along. Now we could have full CD audio quality with file sized running about a megabyte per minute of music. Suddenly computerized stage audio became practical, with absolutely top sound quality. So I told the Rhody organizers that I didn't intend to use cassettes this year; instead I wanted to borrow the original recordings, which I would then digitize onto the computer.

Soon I had a collection of MP3 files stashed into a computer directory named RHODY, about 30 megabytes representing 30 minutes of recorded music. Just before rehearsal I organized the music into the correct running order and then loaded the whole works into the little Rio MP3 player.

I arrived at rehearsal with the Rio, and my laptop computer containing the same music as a backup. As a backup-backup I had the Tascam cassette machine with a tape of all the Rhody music, previously played into it from the Rio. My intention was to hook up the Rio to a stereo line input of the big Yamaha audio mixer, and hit the 'play' button for every music cue. The Rio would automatically move on the the next song after each one was played...

But that system fell apart pretty quickly. The show's director wanted to rehearse the segments out of order, and since there is no song display on the Rio other than track number, it was hard to find the correct track quickly. As well, some of the tracks such as the 'marching up the aisle music' had to be played continuously for over 15 minutes. So the Rio got knocked from the top job, replaced by the laptop computer as the prime recorded music source. Its WinAmp MP3

player program (from **www.winamp.com**) made it easy to shuffle the playlist order right up to within seconds of the performance, and you could make it keep playing the same track over and over by repeatedly hitting the ENTER key at an appropriate phrase in the music.

Flawless performance

Needless to say, the coronation performance went without a hitch. On every music cue, all I had to to was hit ENTER on the music cue, and the start was instantaneous, not delayed by a second or so of cassette run-up time. It reminded me of the old tape 'cart' machines we used to use in radio and TV stations. Press the button for music, right on cue.

The next big MP3 exercise comes in a few weeks, for the annual Las Vegas-style Revue put on by a local dance school. Almost all of this is traditional tap-dance, performed by ladies from around four years old up to 81. The ladies in the middle of the range, having danced most of their adult lives, are in perfect physical shape, and when they prance out there on stage in their matching tights, oooohhhh... (We'd better get back to technical stuff!)

This annual performance is known around town as the 'horror gig', and the only reason I landed it in the first place is because everyone else refused. Last year's concert featured something like 67 acts in two non-stop hours. One group would dance off to the right of the stage as another entered from the left, and at just the right crossover point I was supposed to stop one music track and start another.

There is no way anyone could change cassettes that fast and furiously, even with an assistant; so the show's producers recorded all the music onto one tape, in the order to be played. There was a break of three or four seconds between each track, and even if you let the tape roll there were still pauses that badly slowed down the pace of the show.

This year we're going to do it just like Rhody — turn every music track recorded into an MP3 file. That way it's easy to rehearse the acts out of sequence, and the playlist can be changed at any time right up to performance. The music quality will be better, and — there are other advantages. There is a director for this show, in communication with all the crew via headsets: "Hurry up get the red curtain closed! Who's moving that chair on stage? Are you ready Tom (yes) lights! Here we go, hold on number eighteen just threw up! Tom, skip through to nineteen..."

With the cassette system, skipping through to nineteen meant putting on headphones and listening to the cassette while holding down the fast forward button, then stopping at the next silence, while the director panicked. With the computer and MP3, I casually press the down-arrow key to skip track 18 and then press ENTER when cued by the director for 19. Of course, the cassette machine will still be there — just in case the computer begins feeling unwell.

With all this digitizing of music tracks onto the computer, I began to realize what I was actually using: One fine stereo digital audio recorder capable of producing CD-quality sound from any microphone or stereo 'line in' source. I'd had the computer for some time, but only now discovered this use for it.

The computer's sound card provides software input and output interfacing with other programs. They may be raucous computer games, or perhaps a two-way voice system allowing you to hold spoken conversations over the internet. The 'other end' of the sound card provides hardware interfacing for speakers or headphones, or as line-out to an audio system. Although purists would cringe at using a speaker output as line-out, in practice the quality is usually superlative. Hardware inputs include a microphone input (mono only), and a stereo line-in connection.

The sound card software is often set up to emulate a studio mixer for the sound card's input. Sources can include a WAV source, line-in, microphone, CD audio, or a MIDI synthesizer. Each has its own slider/fader, complete with a checkbox to select or deselect that channel. There's also a master-gain slider, complete with 'LED' VU-meter. Each fader is associated with a stereo balance control.

It is important to realize that the input side of the sound card, with its audio mixer, is available as data to any computer program that cares to use it. The one I've found most useful is a sound recorder program called GoldWave (**www.goldwave.com**). It's simple and small, but very capable. Anything coming in through the input mixer is presented to the input of GoldWave. GoldWave's output is a .WAV file with selectable quality (and size) ranging from crummy telephone to full CD quality.

Record away...

The most direct use of GoldWave is to plug something into the computer's mic or line-in socket, and record away. This is where I connect the Tascam Ministudio to play cassettes into the system to be digitized. If you instead connected the line-in to the left and right outputs of a decent studio mixer, you could make multi-microphone studio recordings straight into the computer with full digital CD quality. Sound interesting?

Any other audio source can be fed to GoldWave for recording, and you can play back your recordings to speakers or phones through the sound card's output. The screen photo shows GoldWave busy recording a MIDI file into a .WAV file. At the top of the screen, the Windows Media Player is playing the MIDI audio into the system. Below the Media Player is the input mixer for recording. To the right of the mixer is a control panel for the recorder, containing the usual record, play, pause, shuttle controls, and stereo VU meters. And behind it all you can see a representation of the .WAV file being recorded. This is where later editing takes place.

GoldWave has lots of interesting effects such as reverb, speedup and slowdown, and you can cut and paste chunks of songs with ease. I've been working on a 'music video' for our community TV station. This features a recording of a nickelodeon song, showing the words running along the bottom of the screen. The verses and choruses in the lyrics didn't match those in the nickelodeon recording, so I cut and pasted like crazy to rearrange the recording. It's very clean and precise; the listener will never know...

CD quality eats up about 12 megabytes per minute of recorded sound, but you seldom leave it that way. Once you're happy with your production you can use a program called Audio Catalyst (**www.xingtech.com**) to compress your WAV file into an MP3 file many times smaller than it began. Then you can delete the WAV file to reclaim the disk space.

Audio Catalyst is also the program which 'rips' digital CD tracks straight to MP3 files without translating them to audio first. It was described in detail in Madhouse two months ago. I liked Audio Catalyst so much that I paid the $30 shareware fee to register it. And as luck would have it, the next version, released a few weeks later, was free — no registration required.

Most sound sources are a simple straight-in proposition, but MIDI is a special case. The best MIDI players use wavetable synthesis, in which sounds are made up of digital samples of real instruments, stored in hardware ROM. Cheaper MIDI players use FM synthesis, in which a system only approximates the instruments, usually with very unsatisfying results. My laptop has an FM synth which sounds awful, but I'm using a Yamaha S-YXG50 'softsynth' instead (**www.yamaha.xg.com/english/xg/s-synth/s-synth.html**).

This is a software wavetable MIDI synth with the instrument samples stored as large computer data files instead of in hardware. The software synth's output is in WAV format, so this is what is selected on the recording mixer. MIDI results are very nice, especially piano sounds. This is an excellent state of affairs, because my collection of 'piano-roll' MIDI files is growing every day. My collection of MP3's is growing too, mostly stored in a directory called HOMEBREW, manufactured right in my own computer. ❖

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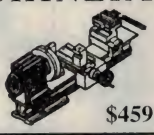
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Construction Project — PC-driven Video Module

(Continued from page 59)

Now turn on the power supply to the module, and see what appears on the monitor. If all is well, you'll see some sort of video. It will probably be out of lock, but don't worry at this point; the STV5730A needs to be reset via the PC software, before everything locks into place.

Turn on the PC if it isn't already on, change to the DATA subdirectory and fire up the demo software by typing 'STV5730' followed by pressing the [Enter] key. Assuming the software finds your OSD module via the printer port and cable, it'll start up correctly and give you a simple menu with 10 options.

To initialise the STV5730A chip, press '5' and [Enter]. This performs a software reset. Then press '3' and [Enter], and you'll get a line requesting a 'context' file to download. If you type in INIT.DAT, followed by [Enter], the screen on the video monitor should clear after a second or two, and you should see a stable picture of your incoming video.

Now press '3' + [Enter] again, followed by DEMO1.DAT and [Enter] once more. You should now be rewarded by seeing a screen display like the screen grab of Fig.1, with the bottom 'OSD5730' line blinking impressively.

To see some of the other possibilities that the STV5730A chip can achieve, try keying in '3' + [Enter] again, followed by the name of the other 'demo context files' provided in the demo software — with names from DEMO2.DAT to DEMO6.DAT, and also CBAR1.DAT.

This demo software is very basic (read 'primitive'), but it should at least get you going. It's also dirt cheap, because as mentioned earlier you can download it from the ST Microelectronics website, and hopefully from the EA website as well. For those without web access, it will also be for the cost of a floppy disk plus minor pack and post charges from RCS Radio, of 651 Forest Road, Bexley 2207.

That's about it. The PCB has been designed for experimenters, and I also have several 'plug-ins' which have been built and tested — ask at RCS Radio for more details. ❖

Listed below, everything most Australians know about MS
MS
For more information about multiple sclerosis contact the MS Society in your state.

Electronics Australia **is one of the longest-running technical magazines in the world. We started as *Wireless Weekly* in August 1922 and became *Radio and Hobbies in Australia* in April 1939. The title was changed to *Radio, Television and Hobbies* in February 1955 and finally, to *Electronics Australia* in April 1965. Here are some interesting items from past issues:**

50 years ago

August 1949

Testing New Radio Telephone: In the near future, Australian citizens in capital cities will be able to have their cars fitted with radio telephones, enabling them to speak to ordinary telephone subscribers while their cars are in motion. The PMG has completed preliminary work which will allow the service to be provided at a rental of £51 per year.

This rental will be in addition to the cost of installing the necessary apparatus. On present indications, this will almost certainly run into some hundreds of pounds for each car. It is anticipated that services will be set up in Sydney and Melbourne about November of this year.

New Record Changer: A tremendous campaign is going on in America to popularise the latest RCA record changer and its 7" records. Whatever might be thought about the wisdom of such a radical change, it looks as though the new product will have a big influence on recorded music in the USA.

The records themselves are 6-7/8" in diameter and play for more than five minutes. To do this, the grooves have been placed closer together and the motor runs at 45rpm rather than 78rpm.

25 years ago

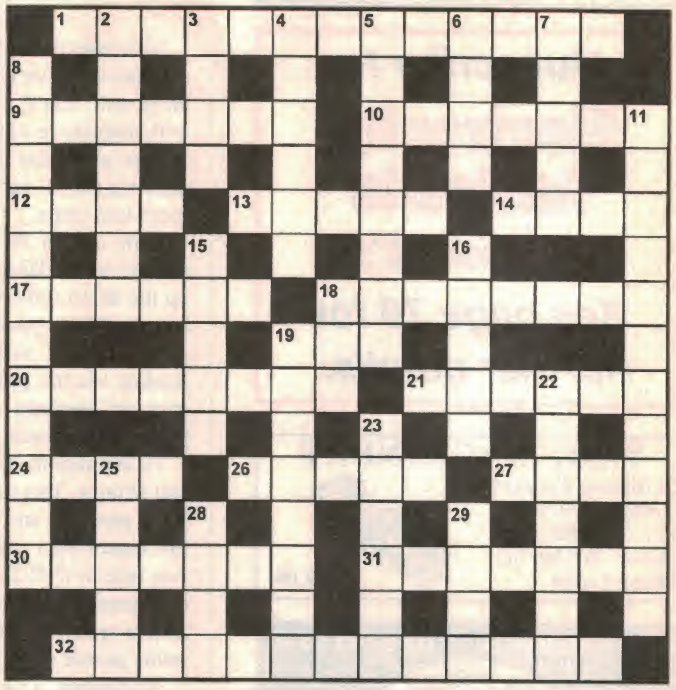
August 1974

Low Loss Optical Fibres: Scientists at Bell Laboratories have devised a new manufacturing process for making low-loss light fibres. Light sent through fibres made by the new process loses only about one-third of its intensity over a distance of one mile. In ordinary glass of the sort used in window panes, this order of reduction in intensity would occur in a small fraction of an inch.

The new process is derived from a technique widely used in the semiconductor industry, known as chemical vapour deposition. The glass fibre core, and in some cases its surrounding glass jacket (the 'cladding') are formed, layer after layer, from gasses passing through a fused quartz tube. The gasses are heated sufficiently to react with one another, and are fused on the inner wall of the tube. The tube is collapsed by further heating and then drawn into the thin fibres that transmit light pulses.

EA World Exclusive DIY Computer: This month we present the first of a series of articles describing a complete general purpose stored-program digital computer, designed specifically for home construction. To the best of our knowledge it's the first time, anywhere in the world, that this has been done. Jim Rowe's little 'EDUC-8' computer should make an ideal project for anyone keen to learn how a computer really works. ❖

Crossword



Across

1 Portable player. (6,7)
9 Survive longer than. (7)
10 Rooms for exposure to UV. (7)
12 Raised platform for speaker. (4)
13 Short burst of radiation. (5)
14 A dull sound. (4)
17 Make settings in advance. (6)
18 Musical composition. (8)
19 Substance than can be detonated. (1,1,1)
20 Voice or music quality test. (8)
21 Dedicated broadcasting room. (6)
24 Test. (4)
26 Unit of magnetic flux. (5)
27 Type of antenna. (4)
30 Reduce activity level. (7)
31 Display of data. (7)
32 Process of increasing strength of signals. (13)

Down

2 Type of ammeter. (3-4)
3 Electric passenger vehicle. (4)
4 A terminal on an amplifier, etc. (6)
5 Final frame of photographic film. (4,4)
6 Individual performance. (4)
7 Significant body in Solar System. (5)
8 Parts of a PA system. (12)
11 Hearing technicians. (12)
15 Prefix indicating 10^{-15}. (5)
16 Said of superior hearing. (5)
18 News-broadcasting organisation. (1,1,1)
19 Unable to distinguish pitch. (4-4)
22 Top game for those into spin control. (7)
23 Word indicating presence of iron. (6)
25 Collection of recordings. (5)
28 Face of timepiece. (4)
29 First name of famous cinematic cartoonist. (4) ❖

July's solution:

S	C	H	O	T	T	K	Y	E	F	F	E	C	T	
E		O		O		R		X		I		O		
E	N	T	R	O	P	Y		E	A	R	T	H	E	D
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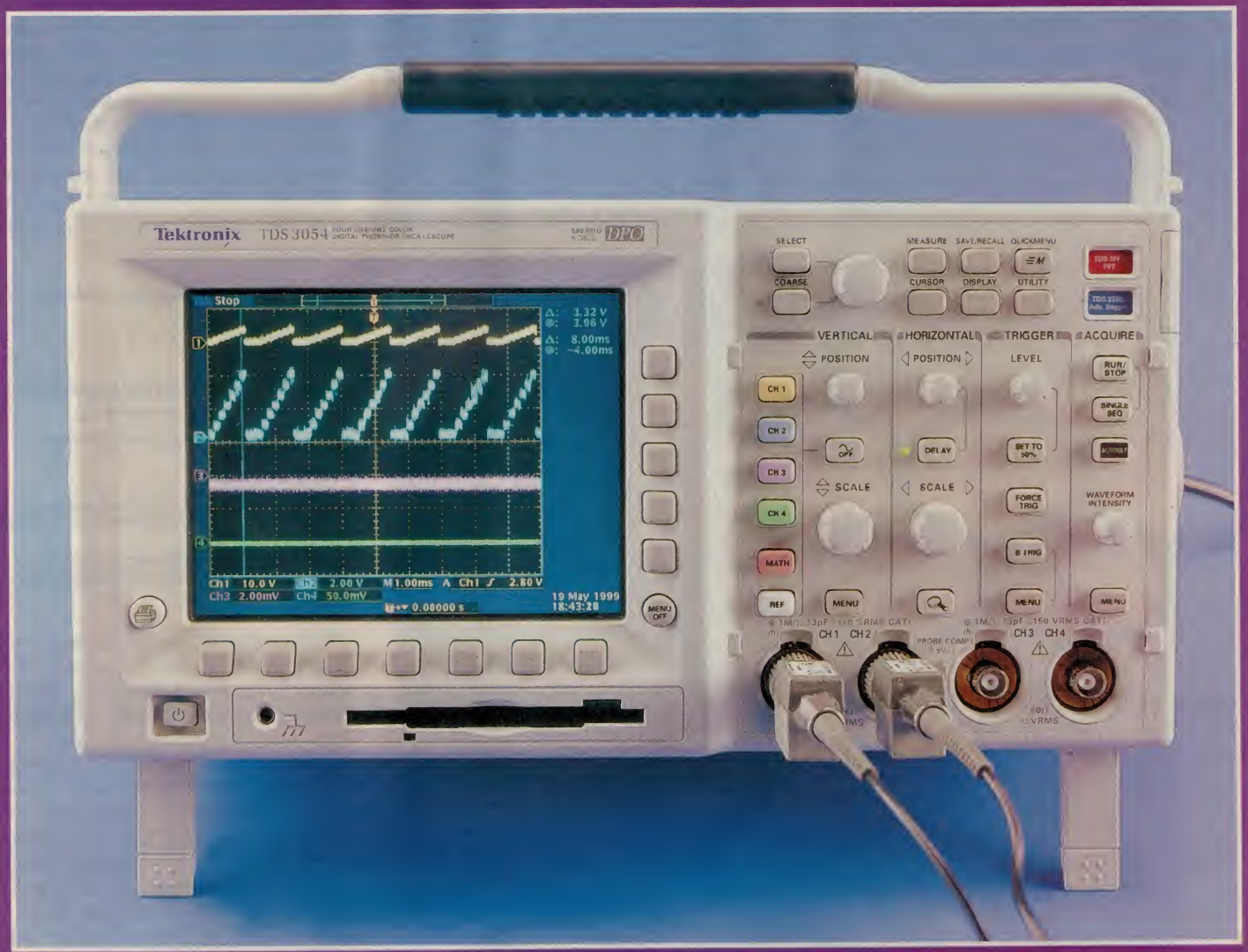
Electronics Australia's

Professional Electronics

CSIRO's new carbon nanotube technology: a breakthrough in flat-screen displays

Bell Labs claims its new ultra-thin gates will extend the life of silicon transistor technology until at least 2012

Review of the novel osziFOX pen-sized 5MHz scope



The compact new Tektronix TDS3054 'Digital Phosphor' scope: colour plus four channels running at up to 5GS/s...

HIGHLIGHTS

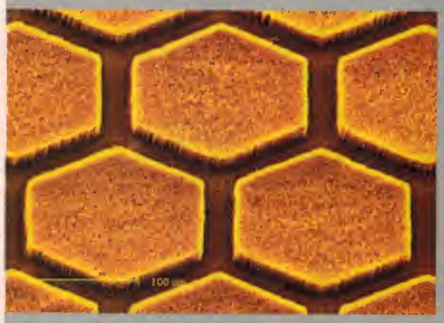
CSIRO achieves flat-screen breakthrough

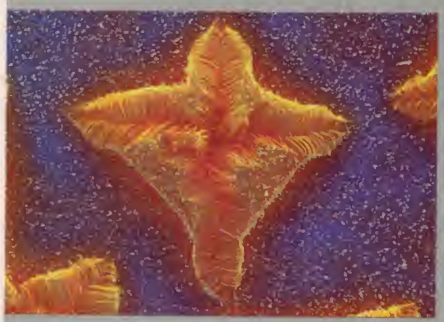
An advance in nanotube technology by Australia's CSIRO is claimed to pave the way for a completely new type of television and computer flat screen. According to researchers Dr Liming Dai and Dr Shaoming Huang from CSIRO Molecular Science, the new flat screens will be longer lasting, more energy efficient and more convenient than current screens. There will also be the opportunity to make them both thinner and flexible.

The screens will use CSIRO's cutting edge research into a new form of carbon known as nanotubes. Carbon nanotubes are arrangements of carbon atoms that are formed into tiny tubes about a millionth of a millimetre in diameter. They were discovered by a Japanese scientist in 1991.

Various nanotubes, with or without encapsulated metals, can now be produced and dissimilar carbon nanotubes may be joined together, allowing them to form molecular wires with interesting electrical, magnetic, optical, and mechanical properties.

In display screens they work as an intermediary, focussing electrons onto a surface where they react with a fluorescent material to produce light for picture displays.





Above: groups of perpendicularly aligned carbon nanotubes, micropatterned for imaging applications. Below shows a smaller 'bunch' of nanotubes.

"It has been a major challenge for researchers to get control of the way they form. In order to use nanotubes for panel displays it is important that the tubes are either aligned or formed into patterns", Dr Dai says. "We have been able to take a lead in this research as we found ways to control the arrangement of the nanotubes."

The research was recognised at the recent Hannover Trade Fair, where CSIRO signed a $300,000 two-year collaborative research agreement with leading Austrian high technology company Electrovac to develop the new kind of screen for TV and computers.

Flat screen technology is expected to generate a multi-billion dollar market worldwide over the next few years.

CSIRO has the opportunity to share in it through its cooperative deal with Electrovac. The deal, signed by CSIRO's Deputy Chief Executive Dr Bob Frater and Dr Ernst Hammel, Electrovac's VP for Technology, marks the start of cooperation which could lead to major commercial opportunities in the longer term.

"CSIRO's carbon nanotube work is world class, and could well lead to exciting developments in flat screen technology," said Dr Hammel after the signing. "This technology is the subject of intensive R&D, especially in the USA, but we believe the Australian research is at the very forefront."

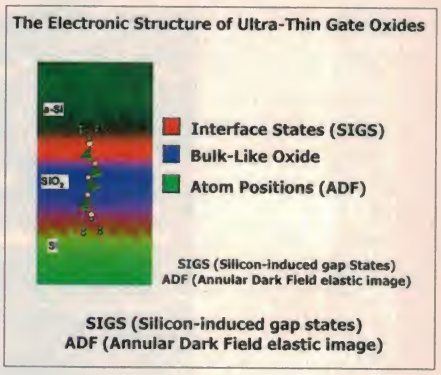
Electrovac was a pioneer in developing liquid crystal displays (LCDs) in the early 1970s, and Dr Hammel is keen for the company to re-enter this market with a new approach to flat screen technology. Electrovac employs 650 people in Austria, Germany and the USA and has a turnover of more than $110 million. It specialises in electronics and thermal management technologies, and in the development of new materials.

"Electrovac is a genuine player in the European and international electronics scene," says Dr Bob Frater. "This is the kind of collaboration we want and need, and it shows just how seriously the Europeans take Australian technology when it meets their needs."

Silicon chips will last until 2012: Bell Labs

The mainstay of the semiconductor revolution — silicon-based transistor technology — may not run out of steam for roughly a dozen years, instead of the previous estimate of fewer than six years, report researchers at Lucent Technologies' Bell Labs in the June 24 issue of *Nature*.

In recent years, the semiconductor industry thought a limiting factor for producing increasingly smaller silicon-based transistors would be the crucial insulating layer. Made of silicon dioxide, the insulating layer on today's chips is typically 25 atoms thick, but the Bell Labs researchers have produced a five-atom-thick layer, the thinnest ever made. They also showed that a four-atom layer is the fundamental physical limit for silicon dioxide-based insulators.



The research results suggest that an alternative insulating material must be found before 2012. Or, if alternative insulating materials are not found, totally new semiconductor technologies will be needed.

"Having extended the fundamental physical limits of silicon dioxide gives the semiconductor industry more time to develop alternative insulating layers", said Bell Labs researcher David Muller, who used the most sophisticated electron microscopy technique available today to confirm the thickness results.

Other Bell Labs researchers working on the project included Thomas Sorsch, Stephen Moccio, Frieder Baumann, and Kenneth Evans-Lutterodt. A portion of the microscopy research was done at Cornell University's Center for Materials Research.

The insulating layer, known as the gate oxide, is the device's smallest feature. It lies between the transistor's gate electrode, which turns current flow on and off, and the channel through which this current flows. The gate oxide acts as an insulator by protecting the channel from the gate electrode, thus preventing a short circuit.

By continually reducing both the gate oxide thickness and the length of the gate electrode, the semiconductor industry has doubled the transistor's switching speed every 18 to 24 months, following what is known as Moore's Law.

"Bell Labs research on ultrathin gate oxides is delivering technology advances that we are applying to new generations of communications ICs", said Mark Pinto, chief technology officer for Lucent's Microelectronics Group. "These advances will enable us to provide system-on-a-chip capabilities with more performance and lower power consumption for such demanding applications as third-generation wireless systems."

To produce the ultrathin gate oxide, it was essential to 'grow' atomic layers that were absolutely uniform and smooth. That's because the top and bottom layers were adjacent to the silicon itself, leaving only three layers in between. All three of the middle layers needed to be completely intact to prevent electrons from escaping through the gate oxide, which would lead to a short circuit.

Tackling the gate oxide challenge, researcher Greg Timp and his Bell Labs colleagues first cleaned the silicon and then used an unconventional process to add oxygen to the silicon to grow silicon dioxide. They used a process known as rapid thermal oxidation, which exposes the silicon to 1000°C for 10 seconds. To study the resulting gate oxide, which was later incorporated into a working transistor, Muller used a scanning transmission electron microscope.

Because the Bell Labs findings are based on only research results, reliability and yield issues still must be explored before using these ultrathin gate oxides in a manufacturing setting.

WorldWide Web inventor Tim Berners-Lee (left centre) is presented with a symbolic chair by 3Com Corp's CEO Eric Benhamou at 3Com's headquarters in Santa Clara, watched by President of MIT Charles Vest (L) and Ethernet inventor Dr Robert Metcalfe (R).

AMD claims world's fastest x86 microprocessor

AMD says that it has commenced shipments of its new seventh-generation microprocessor, the AMD 'Athlon' processor, to computer manufacturers. Formerly code-named the AMD-K7 processor, the AMD Athlon processor is initially available in speed grades of 600, 550 and 500MHz.

"For the first time in the history of the computer industry, AMD leads the competition in delivering an entirely new generation of processors that offers not just higher clock speeds, but higher performance and processing capabilities clock-for-clock based on a more advanced architectural design", said W.J. Sanders III, chairman and CEO of AMD. "This announcement is truly a watershed for AMD and the entire industry, because it heralds new choices based on superior processor technology for system platforms in the enterprise space."

The AMD Athlon processor is said to be a true seventh-generation processor in terms of its architectural capabilities and delivered performance. It is an x86-compatible design featuring a super-pipelined, nine-issue superscalar microarchitecture optimized for high clock frequency; the industry's first fully pipelined, superscalar floating point unit for x86 platforms; high-performance cache technology, including 128KB of on-chip level-one (L1) cache and a programmable, high-performance backside L2 cache interface; enhanced 3DNow! technology and multimedia performance; and the AMD Athlon system bus — a 200MHz system interface based on the Alpha EV6 bus protocol with support for scalable multiprocessing.

The initial versions of the AMD Athlon processor are manufactured on AMD's 0.25-micron process technology in its Fab 25 facility in Austin, Texas.

HPM Technologies has now released the HX330-PC World Time Clock, which provides PCs and their software with accurate time and date information via the Company's TeleChron radio time signals. (For more information see their website at ***www.hpmtech.com.au)***

Foxboro & APV join Invensys group

Australian companies Foxboro and APV have officially joined Invensys plc, the world's largest automated control systems manufacturer. At a Sydney launch chairman of London-based Invensys plc Lord Colin Marshall said Foxboro Australia and APV will form a new group, Invensys Intelligent Automation Australia.

The name change coincides with the opening of Invensys Intelligent Automation's new $4 million Australasian headquarters in Waterloo, Sydney. NSW Minister for Information Technology & Energy, Kim Yeadon, officially opened the 6500m² building, which was gutted and refitted to suit Invensys's requirements for a major R&D and integration facility.

Invensys Intelligent Automation Australia is the leading supplier of automated control systems for the electricity generation and distribution industries, and has won major rail automation contracts in Australia and overseas. Its four key business units are Sydney-based Foxboro SCADA International and Foxboro Australia & New Zealand; Melbourne-based APV; and the Brisbane-based Foxboro Transportation Group. The four units have a combined annual turnover of $225 million.

New hi-tech business complex for North Ryde

Due to be completed in October 1999, the new Rydecorp business complex at Eden Park Estate in Sydney's North Ryde measures 10,300m². It has been specifically designed to suit the needs of small to medium companies in high tech industries and is intended to be used as a technology orientated complex.

Located just 14km, or 15 minutes from Sydney CBD and close to the M2 motorway, Rydecorp is positioned in what's claims is an ideal location. Located close by Rydecorp is the 'Macquarie Centre' regional shopping centre, the Stamford Hotel, Macquarie University and CSIRO facilities. The NSW State Government has also announced plans to build a rail service between Parramatta and Chatswood, and if rumour proves correct a station will be built on Waterloo Road, just 300m from Eden Park. →

Some of many major electronics organisations located in this area include Plessey, Philips Electronics and GEC Marconi, so smaller electronic companies have the opportunity to be close to the bigger organisations with which they do business.

When Rydecorp is completed individual premises will be available from 400m² to 1100m². Some of the innovative features of the development include lifts servicing all areas of the building, air-conditioned carpeted office space and 180 off-street and basement car parking spaces.

Fujitsu & Siemens joining computer forces

Fujitsu Limited and Siemens AG have announced the signing of a Memorandum of Understanding to create a far-reaching co-operation that significantly expands their joint activities in the worldwide computer market. As part of this, the two companies will merge most of their European computer operations and establish a joint-venture company — Fujitsu Siemens Computers — to develop, manufacture and market a full range of information products. Capitalising on the complementary strengths of each partner, an extensive development and mutual supply arrangement will be established between the two partners and their group companies around the world.

Through these measures, Fujitsu and Siemens aim to jointly capture a top-three industry position within the combined worldwide markets for personal computers, Intel based and UNIX servers and large-scale enterprise systems. Together, the sales of the two organisations in these markets already place them at number five in the world.

The new co-operation, which builds on a close Fujitsu-Siemens relationship cultivated over more than two decades of technological exchange and strategic business collaboration in the computer field, is planned to greatly enhance their ability to win and service major global IT accounts.

According to the MoU, Fujitsu and Siemens will each hold a 50% equity stake in the new company, with equal representation on its Board of Directors.

In-store servicing for mobile phones

Ericsson has claimed a first in the Australian mobile communications industry with its launch of in-store mobile phone service desks across Australia. The service desks, to be known as Ericsson Service Points, will open first in key population centres in regional Australia.

"This represents a first for Ericsson, a first for the Australian mobile communications industry and a first for regional Australia, bringing service as close as possible to the customer, said Mr Leo Mautone, General Manager of Customer Services for Ericsson Mobile Phone and Terminals.

"In the past, mobile phone users in regions without an Ericsson Accredited Service Centre had to send their phones away for repairs and upgrades. Now they can be assisted locally, thanks to Ericsson", continued Mr Mautone.

"Around 70% of all faults will be fixed on the spot by a local serviceperson, ensuring a more efficient and personal service for regional mobile phone users. Mobile phones that require more comprehensive work will be repaired off-site, and customers loaned an Ericsson mobile phone in the interim."

The first Ericsson Service Points have recently opened in Newcastle, Wollongong and Geelong, with around 50 Service Points to be in operation by the end of 1999. The Service Points are self-contained service desks connected to Ericsson via the Internet. The units are equipped to undertake mechanical repairs, and include a PC, barcode scanner, specialist service tools, software, spare parts, loan phones and are electrostatic protected. They will be staffed by fully accredited local representatives.

Singapore chooses DVB-T

The Singapore Broadcasting Authority (SBA) has announced the adoption of the DVB-T standard for digital terrestrial TV broadcasting, on the recommendation of the Singapore Technical Committee which was formed to ensure that Singapore selected the standard best suited to its requirements. The committee conducted comparative field trials of all three available DTV standards with the full support of broadcasters, the industry and other standards agencies over a five-month period from May to September last year, and DVB-T came out with flying colours. This was the first time that all three standards have been tested in one country and even included field trials of mobile reception an MRT railway tunnel.

The committee evaluated and compared the standards based on nine criteria: 1. Characteristics of transmitted signals, including mobile reception; 2. Availability of DTV equipment; 3. Cost of implementation; 4. Applications; 5. Interoperability with broadcasting and telecommunications networks; 6. Potential for growth; 7. Spectrum efficiency; 8. Scalability; and 9. Security, and found that although each system performed well in certain areas, DVB did well in all — leading the rankings in seven out of nine criteria.

The SBA was particularly impressed by DVB's robustness in receiving signals in both fixed and mobile conditions, which is critical in a city like Singapore. Another important criterion that favoured DVB was the ready availability of equipment for consumers as well as operators. In addition, DVB is readily compatible with cable, IT and the telecommunications infrastructure and Singapore ONE, Singapore's broadband network.

NFSA becomes ScreenSound Aust

The National Film and Sound Archive of Australia has changed its name to ScreenSound Australia. The new identity was announced and officially launched by the Prime Minister, John Howard MP, on June 21 at the formal opening of the Archive's newly constructed technical wing.

The new name is shorter and easier to remember, and is also part of a strategy to develop the public role and services of the institution. Its nature, role and traditional activities as the national film, television, radio and sound archive of Australia continue unchanged.

To coincide with the relaunch, the Archive's website has gone 'live' at **www.screensound.gov.au**. Here callers can have online access to the catalog of the National Collection of screen and sound. ❖

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SOLID STATE Update

LATEST DEVELOPMENTS IN SEMICONDUCTOR TECHNOLOGY

CCD VSP chip for digital cameras

Burr-Brown's new VSP2101 video signal processor is a complete digital camera integrated circuit (IC) providing signal conditioning and 10-bit analog-to-digital (ADC) conversion for the output of a CCD (charge-coupled device) array. The VSP2101 is designed for high resolution 'mega pixel' CCD arrays used in imaging systems such as digital video cameras, digital still cameras, PC/video conferencing cameras and security cameras/closed-circuit TV (CCTV).

The VSP2101 is said to surpass competitive products by offering low voltage, low power operation and excellent low noise performance for connecting a sensor input to a digital signal processor. Low voltage (2.7V to 3.6V) and low power (160mW at 2.7V) make it well suited for small size and portable equipment by extending battery life, while the low noise provides improved picture quality.

The VSP2101's primary CCD channel provides correlated double sampling (CDS) to extract the video information from the pixels, 0dB to +34dB gain range with digital control for varying illumination conditions, and black level clamping for an accurate black reference.

The device provides input signal clamping and offset correction for the input CDS. The stable gain control is linear in dB and the black level is quickly restored after illumination changes. In addition, an on-chip 10-bit D-A converter allows generation of an analog control voltage for iris control.

Other features include 27MHz conversion rate and no missing codes.

For more information contact Kenelec Scientific, 23 Redland Drive, Mitcham 3132.

Chip has thermometer plus clock/calendar

Dallas Semiconductor claims its DS1629 Two-Wire Digital Thermometer and Real Time Clock is the first digital system component to incorporate a direct-to-digital temperature sensor and a real-time clock and Y2K-correct calendar on one chip. Previously, designs for digitally monitoring thermally sensitive instruments and operating equipment have required a separate chip for each funciton, with separate programming configurations and interfaces.

The chip's digital thermometer is accurate to +/-2°C with 9-bit readouts in increments of 0.5°C. The user can even fine-tune a thermostatic response for extra sensitive applications, yielding 13-bit readouts in increments of 0.03125°C. The real-time clock/calendar counts time from seconds through years, with leap year compensation through 2100.

For timed and/or thermostatic interrupt functions, the DS1629 has open-drain alarm outputs that activate at user-defined setpoints. For example, the user can set an interrupt for a certain time or at time intervals, at certain temperatures, or at temperatures occurring over specific periods of time. An additional 32 bytes of memory are available as a notebook for general use data. All communication is accomplished through a standard two-wire serial interface.

For more information contact Dallas Semiconductor, 4401 South Beltwood Parkway, Dallas Texas 75244-3292 or visit their website at **www.dalsemi.com**.

Low power 12-bit ADC has four channels

Burr-Brown's new ADS7842 is a four-channel, 12-bit sampling analog-to-digital converter (ADC) with a parallel interface. It contains a 12-bit, capacitor-based SAR A/D with a sample-and-hold amplifier, interface for microprocessor use and parallel, three-state output drivers.

The ADS7842 is specified at a 200kHz sampling rate while dissipating only 2mW of power. The reference voltage can be varied from 100mV to +Vcc with a corresponding LSB resolution from 24uV to 1.22mV. It is guaranteed down to 2.7V operation.

Low power, high speed and on-board mulitplexer are claimed to make the

ADS7842 ideal for battery-operated systems such as portable multi-channel data loggers and measurement equipment, as well as industrial process control, remote data acquisition, and medical instrumentation.

For more information contact Kenelec Scientific, 23 Redland Drive, Mitcham 3132.

Fast laser-made CPLD replacements

Clear Logic's new 2500-gate CL7128E and CL7128S low cost pin-compatible replacements for Altera's MAX EPM7128E and EPM7128S CPLDs are claimed ideally suited for volume production. The two new devices are the first MAX 7000 replacements to implement Clear Logic's Laser-Processed Logic Device (LPLD) technology, announced in November 1998.

The fastest CL7128 devices have 5ns delays — 20% faster than the 6ns offered by Altera's fastest 5V EPM7128 devices. The shorter delays make CL7128 LPLDs ideal for wireless communications applications such as routers and switches that require high throughput and use state logic to route data to different addresses.

Clear Logic says the shorter delays of its LPLD devices are a direct result of the proprietary LPLD technology. The company's laser-processed logic devices are not customer-programmable and, therefore, do not requre any of the transistors that are required for programmability in Altera CPLDs. As a result, CL7128 devices have about 200,000 fewer transistors, a massive reduction that reduces the parasitic capacitance of CL7000 devices by 50%.

The lower transistor count also results in a die size reduction of 43%, allowing Clear Logic to deliver CL7128 products at prices that are 20% to 70% lower than Altera's.

Clear Logic LPLDs use macrocell-based logic structures, similar to those in Altera MAX 7000 CPLDs, with the result that the two device families have identical functionality. Both families of devices have product term AND arrays, registers, and I/O control blocks. Logic signals are routed on the chip by a central interconnect array. The pinout and the I/O characteristics of both types of devices are identical. In fact, LPLDs will directly accept the programming files from Altera MAX 7000 designs without any modification. Prototype CL7000 devices can be obtained by emailing the Altera MAX 7000 programming file to Clear Logic.

For more information visit Clear Logic's web site iat **www.clear-logic.com**.

Faster low-Ron Power MOSFETs

Three new power MOSFETs with greatly improved specifications for notebook computer and CPU point-of-use DC-DC conversion applications have been released by Vishay Siliconix. The new PWM-optimized Little Foot devices combine lower on-resistance and gate charge specifications with record switching speeds, which together ensure maximum efficiency in power conversion circuits across all typical load ranges.

The three new N-channel SO-8 devices allow designers to choose the best combination of on-resistance, gate charge, and switching speeds for their applications. For designs with higher load currents, the Si4880DY offers on-resistance of 8.5mΩ at a 10V gate drive, with gate charge of just 19.5nC and turn-off times of 46ns. For designs that require the fastest possible switching, the Si4800DY offers turn-off times of 22ns (a record for this type of device) with on-resistance of 18.5mΩ and gate charge of 8.7nC. For designs between these extremes, the Si4890DY offers on-resistance of 12mΩ, gate charge of 14nC, and 35ns turn-off times.

For more information contact Vishay Asia, Keppell Building #02-00, 25 Tampines

Street 92, Singapore 528877, or visit the website at **www.siliconix.com**.

38MHz CMOS op-amps offer rail-rail I/O

Burr-Brown's new OPA350 series CMOS operational amplifiers feature high-speed operation, rail-to-rail input and output, low noise and micro-package options. Available in single, dual and quad versions, this series is ideal for driving sampling A-D converters, audio applications, communications, video processing, and providing I/V conversion at the output of D-A converters.

The OPA350 series provides excellent DC performance and operates on a single supply as low as 2.5V with true rail-to-rail input — input common-mode voltage range extends 300mV below ground and 300mV above the positive supply. Output voltage swing is to within 10mV of the supply rails.

In addition to rail-to-rail input and output, key features include wide bandwidth (38MHz), high slew rate (22V/us), low noise (5nV/√Hz), low offset voltage (+/-500uV max), and low THD+Noise (0.0006%). Single, dual, and quad versions have identical specifications for maximum design flexibility.

For more information contact Kenelec Scientific, 23 Redland Drive, Mitcham 3132.

PowerPC 750 plus SSRAM for embedded control

White Electronic Designs has introduced a multichip package that combines a PowerPC 750 RISC processor with 1MB of SSRAM L2 cache. The WED3C750A is claimed ideal for embedded control applications where density and performance are a priority. The combination of the 750 processor and two 4Mb SSRAM devices on a single interposer results in 60% board space savings compared to discrete approaches.

White will offer the device in ceramic ball grid array packaging suitable for extended environment applications such as aerospace, guidance, navigation, power control and fire control. It is optimized for high performance, space sensitive, low power systems and supports power management features such as doze, nap, sleep, and dynamic power management.

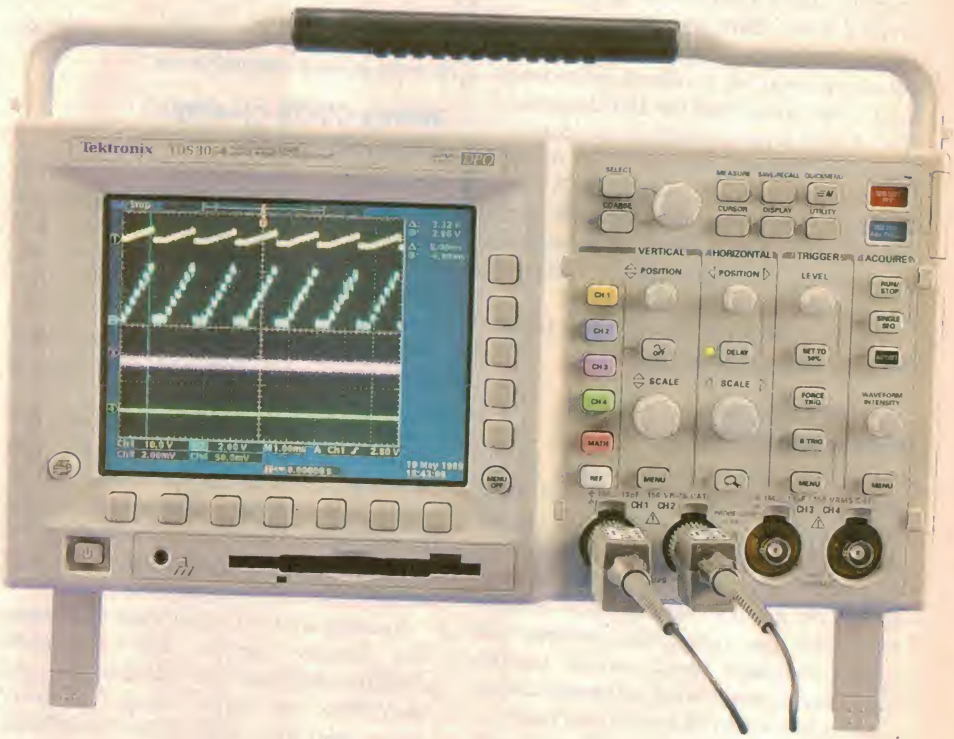
The 200MHz processor and two 128K x 36, 100MHz synchronous pipeline SRAMs are flip-chip attached on a 255 CBGA or optional CCGA (Ceramic Column Grid Array). Footprint compatible with the 740 BGA, the module measures 21 x 25mm — 525mm², compared to 1329mm² for a discrete approach. Additional benefits include lower inductance and capacitance for increased performance; reduced I/O pin count (255 vs 560) for reduced PCB density; and reduced part count.

For more information see the White Electronic Designs Corporation Web site at **www.whiteedc.com.**❖

Tek's TDS3054 'DPO' oscilloscope

In late 1996, we reviewed Tek's TDS220 'shoebox' oscilloscope. Since then, scope technology has advanced significantly, and the features now packed into Tek's TDS3000 series scopes are downright unnerving. They've squeezed a colour screen, DPO technology and up to four channels running at 5GS/s into a package the size of a lunchbox.

BY GRAHAM CATTLEY



I WAS FIRST introduced to one of Tek's Digital Phosphor Oscilloscopes (DPOs) just over a year ago, and was struck by the significantly realistic way that it emulated a standard phosphor tube. For the first time ever, I was able to view a constellation diagram on a digital scope. This demonstration convinced me that DPO technology is the only hope that digital scopes have of replacing traditional analog scopes on the workbench.

While the original 700 series that I was introduced to sells for a cool $66,000, Tektronix are selling their new TDS3000 series as 'the DPO for everyone', with a considerable reduction in size and a corresponding reduction in price. For a tad over $10,000 (for the two-channel model), you can take advantage of the considerable power of a digital scope combined with the superior look and feel of an analog display. Instead of the artificially clean angular traces typical of digital scopes, it gives you a 'real world' view of the signal, complete with noise, fuzz and shadow images.

On the face of it, this sort of waveform display sounds inferior — surely it would be better to have a clean, clear display, wouldn't it? Well, no, surprisingly not. One of the big problems with a digital storage oscilloscope (DSO) is that you can't see what you are missing, and DSOs tend to miss a lot. Up to 90% of the sampled waveform is simply thrown away in a DSO, as the scope just gives you the one sweep at the timebase you've selected. When the next trigger event occurs, the screen is cleared and the new data is displayed.

In an effort to come up with a display that reflects the incoming waveform more faithfully, a common technique is to leave the old trace on the screen when drawing in the new waveform. This 'persistence' gives you an idea of the changes in the timing and amplitude of the waveform, but doesn't convey the frequency of their occurrence.

The other big problem is aliasing. If you've used a DSO for any length of time, you'll know that it takes a bit of getting used to, and that a fair amount of interpretation is often required to understand just what is being displayed. It is quite common to see harmonics appearing on the trace, as a result of the beat between the sampling frequency and the signal being measured.

These two points alone are enough to prevent many engineers from fully embracing DSOs. Analog scopes simply don't have these problems.

Recognising the limitations of DSOs, Tektronix have developed the DPO, which takes a radically different approach to reading and displaying the waveform. First up, there is a massive amount of parallel processing going on inside, with the data acquisition, signal processing and waveform display sections acting more or less independently.

This means that the DPO can acquire samples continuously — without the processor having to stop sampling, then analyse, rasterise and display the data. Added to this is the fact that Tek DPOs offer some of the highest sampling rates around, boasting a bandwidth of up to 2GHz.

With these very high sampling rates, and the ability to keep on sampling with almost no dead time between sweeps, there are a huge number of samples that can be used to make up the display. During each sweep, samples are taken, scaled, and entered into a database representing the 500 x 200 pixel screen array.

As each sample is entered, the value in that cell is incremented, and it's the cell's final value that decides that pixel's intensity over 16 discrete levels. The more hits, the higher the count in the cell, and the brighter the pixel. In this way, the fast moving rising and falling edges of a waveform are lowest in intensity, while the slower moving parts of the wave are correspondingly brighter. After each sweep, the contents of each cell are decremented ready for the data from the next sweep to be added.

As the displayed waveform is made up from a number of superimposed images, the result looks as though it is displayed on a standard CRT. As a result, noise looks like noise, and infrequent glitches appear as ghostly images on top of the main waveform.

Top of the line

The nice people at Tektronix sent us one of their top of the line TDS3054 DPOs to play with. The TDS3054 supports four input channels, as well as four 'reference' channels for storing your waveforms, and a separate maths channel that shows the results of some of the scope's extended functions.

The main user interface is split between the dozen softkeys surrounding the 640 x 480 x 16 back-lit colour LCD display on the left, and the rather more usual (though uncluttered) array of knobs and buttons on the right.

The TDS3000 series of scopes accept a number of 'extended application modules'. These modules extend a number of the scope's functions by adding such features as FFT, advanced triggering options and extended video facilities.

The 10 x 35mm modules are simply inserted into a slot on the side of the scope, and essentially 'unlock' the various functions contained within the scope's firmware. With the TDS3054 you get the FFT and advanced trigger modules as standard, but for the two-channel models, these modules will have to be purchased separately, along with a firmware upgrade.

Although not supplied as standard, I also received the Extended Video Application module, which adds a number of video triggering options — including triggering on specific lines, field holdoff, IRE/MV graticules, as well as the usual video triggering options. In addition to NTSC, PAL and SECAM, this module supports custom video modes, useful for non-broadcast video systems (as used in security, computer and medical equipment).

Specifications: Tek TDS3052/4

Bandwidth	**500MHz**
Sample rate	**5GS/s per channnel**
Max record length	**10K**
Vertical resolution	**1mV - 10V/div**
Vertical accuracy	**+/-2%**
Timebase	**1ns - 10s/div**
Timebase accuracy	**200ppm**

No DPX...

If you compare the TDS3000 series with Tek's earlier 500 and 700 models, you realise just how much they've managed to squeeze into that compact 'lunchbox' sized box. Unfortunately, it *was* a bit of a squash, and something had to go. Gone is Tek's proprietary DPX imaging processor, responsible for managing a lot of the advanced DPO functions. As a result, the TDS3000 series has a few features missing, including the waveform histogram and colour graded display.

This last feature let you select colour-grading of the displayed waveform rather than intensity-grading. Also missing is the huge number of records acquired per second; this has fallen from 200k/s for the DPX-enabled TDS500 and 700 series, to 5k/s for the TDS3000 series. It's not as bad as it looks though, as the TDS3000 series makes up for brains by substituting brawn; the TDS3000 offers a full 5GS/s *per channel*, while the TDS500 and 700 only supported 1GS/s on each input.

To be honest, I don't think that the missing features will be missed my many users — false colour shading and histograms are nice, but so is the ability to pick the scope up with one hand, and have it run on batteries at a remote site.

For this review, I was planing to set up the 3054 on the bench, and to try to give it a bit of an exercise to see what it was like to drive. A better opportunity arose, however, when the company's fire control systems engineer stuck his head round the door and asked us if we had an oscilloscope he could borrow...

Out in the pump room, we hooked the 3054 across the fire control LAN, to see why a number of spurious alarm events had been occurring. Taking full advantage of the tools at hand, we ran an FFT analysis of the signal. Yes, there were the data packets up in the kilohertz region, but what was this peak down at 200Hz? Closer examination revealed a significant amount of noise on the line — in some cases spikes of up to 30V were popping up on the 24V LAN, and this was causing no end of problems, as you can imagine.

The problem turned out to be due to the fire control LAN being routed along a cable tray containing the supply to a newly installed printing press. The switching of the press' power factor correction capacitors was causing the spikes, but we needed to take back some hard evidence. Luckily, the TDS3000 range comes with an in-built floppy drive, and so we saved the appropriate screen shots, and printed them out later back in the office.

I've recounted this episode because I feel that it highlights a number of aspects of the TDS3000 range. Firstly, the scope was ridiculously easy to drive; we were getting meaningful results only an hour or so after getting it out of the box. Secondly, most of the measurements were taken with the scope balanced on my forearm, while probing around with one hand. The scope's lunchbox size meant that measurements could be taken quickly and easily, in hard-to-reach places.

Lastly, while features such as FFT and advanced triggering might appear to be expensive frills, they can save an awful lot of time. Certainly, we could have found the problem with a bit of work and some convoluted triggering, but by simply pressing a couple of buttons, the scope did the work for us.

All up, I think that the TDS3000 series have a lot to answer for. They're setting the standard for digital scopes, and have wiped analog scopes right off the playing field. High sampling rates combined with some very smart processing has eliminated aliasing and the intensity-graded display has eliminated practically every argument against the digital scope. If there's any way you can afford to buy one, I thoroughly recommend that you do. ❖

Tektronix TDS3054 DPO Scope

A top-of-the-line four channel oscilloscope in a portable (176 x 375 x 149mm) format.
Good points: *Small and compact, excellent display abilities, very high sample rate.*
Bad points: *Well, there is the price...*
RRP: *TDS3054 (four channel), $15,803 ex tax; TDS3052 (two channel) $10,303 ex tax. Application modules are $822.*
Available: *Tektronix Australia, 80(?) Waterloo Road, North Ryde 2113.*

The osziFOX pen-sized scope

You've heard of 'shoebox' oscilloscopes, and even some that purport to be 'handheld', but Emona Instruments are now supplying Pico's new osziFOX oscilloscope — which squeezes a 5MHz digital scope into a probe the size of a marker pen. Sounds too good to be true? Well, there are some limitations, but it does stack up pretty well...

BY GRAHAM CATTLEY

IF YOU ARE like me, you have at home an 'electronics' toolbox used when you need to do a job away from the bench. With any luck, it contains one of those gas-powered soldering irons, the good pair of wire cutters, odd lumps of solder and bits of wire, and a multimeter. I wouldn't mind betting though, that the meter is the only piece of test equipment that you'd consider taking with you — lugging an oscilloscope around with you simply isn't an option, particularly if mains power isn't necessarily available.

Yes, there *are* portable 'shoebox' scopes available, but are *you* going to balance one on the top of a running car engine while you probe around underneath? Probably not.

Of course I'm leading up to something here; the need for a truly *portable* scope that can fit into a toolbox, to provide the extra level of diagnostic ability that you simply can't get with a standard multimeter.

'Fingerheld' scope

The idea of a pen-sized scope is a novel one, and considering the necessarily small display, the osziFOX pulls off the concept quite well. The 32 x 16 pixel liquid crystal display measures only 16 x 11mm square, but it can convey a surprising amount of information. While a waveform will be reduced to a mere 8 pixels high in the positive cycle and 7 in the negative, I was surprised at just how much you could read into such a display. Noise looks like noise, square waves look square, and sine waves look, well, sine-shaped. You aren't going to be performing anything but the most basic signal measurements on the resulting waveform, but you *will* get in idea of the types of signals present.

And while the screen may be small, the number of features isn't. The osziFOX provides you with a full range of triggering options, including auto, and either internal or external edge triggering (both selectable as positive or negative edge). The trigger level can be set to one of six pre-set levels, which doesn't sound like much — but considering that we are dealing with 16 discrete voltage levels, it is more than adequate to achieve a stable display. (A separate socket for an external trigger line is provided on the rear panel, along with the signal ground connection).

The osziFOX supports single-shot and run modes, and 10 sampling rates ranging from 50ns through to 1ms. Two buttons on the top edge of the scope allow you to cycle through an on-screen display, and adjust these settings, while a three-position switch on the rear of the scope lets you select from three voltage ranges: 1V, 10V and 100V. Again, due to the limited vertical display size, there's not much point in having any more than the three voltage

Specifications

Sampling Rates:	**50ns, 100ns, 0.5us, 1us, 5us, 10us, 50us, 0.1ms, 0.5ms, 1ms**
Bandwidth:	**DC: 5MHz; AC: 100Hz - 5MHz**
A/D converter:	**6 bit resolution**
RAM:	**128 bytes**
Input Coupling:	**AC, DC, GND**
Input Voltage Ranges:	**AC: 1Vpp, 10Vpp, 100Vpp; DC: 1V, 10V, 100V**
Triggering:	**Auto, Internal (+/- edge), External (+/- edge)**
Trigger levels:	**6**
Trigger Modes:	**Run and single cycle**
Display:	**16 x 32 pixel LED backlighted LCD**
Serial link:	**19,200 Baud, 7N1**
DVM Accuracy:	**12 to 15%**
Power Supply:	**9 - 13VDC, supplied by circuit under test**
Power Consumption:	**backlight off, 12mA; backlight on, 85mA**
Dimensions:	**165 x 33 x 20mm**
Weight:	**70g**

ranges, as you won't be taking any measurements from the display — the range switch is used simply to attenuate signals in order to fit them on the screen...

A small wheel protruding through the front panel next to the display sets the Y-position of the trace, and so with these two controls (and the sample rate menu), you have reasonable control of the scale and position of the waveform. The fact that the osziFOX has a maximum voltage range of 100Vp-p makes its use a bit limited in mains powered appliances. The scope can withstand a maximum of 100V DC or 100Vp-p AC and so would be more suited to the normal day to day work on low power equipment. And while the osziFOX has a maximum sample rate of 50ns (20MHz), its bandwidth is quoted at 5MHz — still pretty impressive for a handheld device, and more than enough for normal fault diagnosis.

More features

As well as all this, the osziFOX can switch over to become a digital voltmeter as well. One menu option lets you select DVM mode, which displays voltages from 1mV up to 100V with the range selected by the 1-10-100V range switch.

One trap here is that the Y-position adjustment mentioned above doesn't simply shift the waveform on the screen, but instead introduces an artificial offset voltage to the signal being measured. This doesn't matter much in scope mode, however in DVM mode it translates as a standing DC offset voltage that must be nulled out *before* you take your reading. It is easy to forget to do this, and you'll find that the meter may well be reading 4-5 volts high due to the offset.

The osziFOX comes with software for DOS and Win95/3.1x, which displays the current waveform and voltage readings and can save them to disk. Data is transferred between the probe and the PC via a two-line RS-232 link, and it worked first time round when I tried it. You can even print the waveform and setup data (Trigger state, input coupling V/div etc.), although when I tried this it seemed to have a slight font problem. The waveform was fine though. Small, but perfectly legible with an overlaid graticule.

All up, I'd say that the osziFOX is a worthwhile tool, though one that at $299 (inc. tax) is perhaps a little expensive, considering its limitations both in terms of display resolution and voltage range. It is, however, a remarkable tool that will let you rapidly home in on a fault while you are out in the field, and is of course significantly cheaper .than a conventional portable CRO. ❖

OsziFOX pen-type oscilloscope

A miniature scope with a 16 x 32 pixel display, DVM functions and a PC interface.

Good points: *Good triggering options, small display represents waveforms quite well.*

Bad points: *Doesn't take batteries, DC offset problems in DVM mode.*

RRP: *$299 (inc. tax).*

Available: *Emona Instruments, PO Box 15, Camperdown NSW 2050; phone (02) 9519 3933 or fax (02) 9550 1378. Website at:* ***www.emona.com.au***

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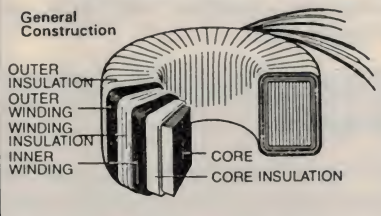

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NEW PRODUCTS

Components & Equipment

Compact insulation tester

The new Hioki model 3453 digital insulation tester is claimed to be ideally suited to testing a large range of electrical installations, providing a novel comparator function with visual and audible alarms, to clearly indicate incipient insulation faults.

The instrument provides testing voltages of 125, 250, 500 and 1000 volts, and respective insulation scales of 40MΩ, 2000MΩ (250 and 500 volts), and 4000MΩ. The digital display provides both a moving average digital readout as well as a bargraph display, therefore combining the best features of both digital and analog instruments. In addition, the instrument indicates the resistance value after one minute, therefore providing an excellent indication of polarisation index.

The comparator function permits the selection of insulation resistance values; e.g., in the 1000V testing range there are 13 fixed values ranging from 1MΩ to 2000MΩ to select from. When the measurement is below a preset value, the 'LO' indication is displayed on the LCD, and an audible alarm sounds. If the line or test object is active (voltage on the line, or test object not discharged), an 'active line' warning lamp flashes, and the bargraph indicates voltage — clearly showing the discharge rate of cables, etc.

In addition to insulation, the instrument also measures low resistance to 400Ω, continuity to 30Ω (with beeper) and AC voltage from 0 - 600V.

For more information, contact Nilsen Technologies, 150 Oxford St, Collingwood 3066.

Regulated bench supplies

The new Kenwood EMC-compliant PDS EMC series power supplies are suited to laboratory, development, service and production tasks. The PDS series are equipped with built-in active smoothing filters which provide an input power factor of better than 0.95 and minimise harmonic current generation. Innovative switching and dropper circuits also provide very low output noise. The PDS series is characterised by its ability to handle very large input voltage swings (90 - 260V AC).

The output parameters cover the range from 0-20V (0-18A) to 0-120V (0-6A). Up to three power supplies can be operated in master-slave configuration as either

Tiny PCB video cameras with mike

New from Allthings Sales & Services are two tiny PCB video camera modules complete with an on-board microphone and preamp. These are a complete video camera with audio, lens holder and lens, on a printed circuit board. They only require a 12V DC supply and may be connected directly to the composite video (AV) input on a VCR, TV, video monitor, PC video capture card, video transmitter, etc.

Fitted with either a 3.6mm board or 5mm pinhole lens, and high sensitivity electret microphone, the modules have a PCB size of just 32mm x 23mm. Image quality is better than VHS, sensitivity is 0.2 Lux and suitable for most common and many low light situations. Spectral response is 400 to 1000 nanometres, allowing use of infra-red illumination for discreet/covert surveillance or to enhance detail in inspection systems.

Options and accessories include a microfine zero-backlash focus system; 18 lenses from 2.1mm to 25mm focal length; IR cut filters to enhance resolution, sharpen focus and improve colour-to-grey conversion; polarising filter for glare and exposure control; IR pass filter for focus control; and high output IR illuminators or separate IR LEDs.

To simplify installation there are two single-cable solutions, a flexible 5mm diameter 4-core shielded cable or baluns that allow use of LAN or common telephone cable.

The MOD-BW 206 camera modules are priced from just $85 including tax. More information is available from Allthings Sales & Services, telephone (08) 9349 9413 or website at **www.allthings.com.au**.

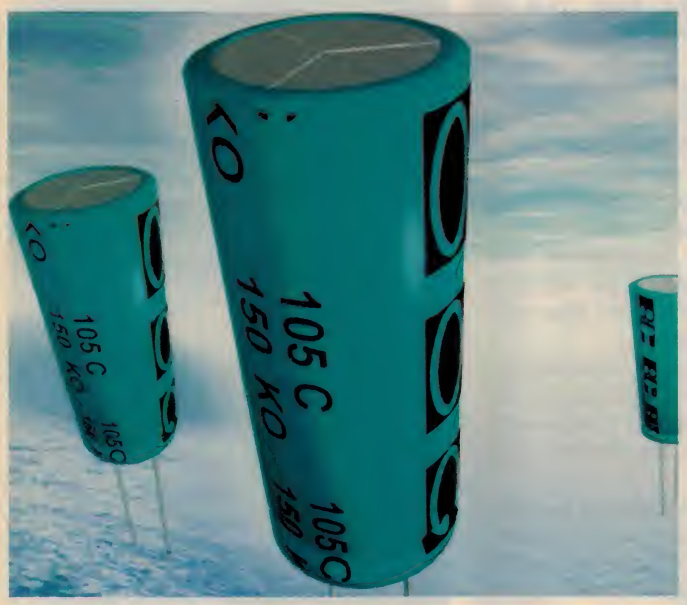
parallel (doubling or tripling current) or series (doubling voltage) with one slave only.

The supplies can be easily controlled manually using a rotary encoder to set voltage and current limits. Frequently used voltage and current parameters can be stored (up to three parameter pairs) and can be locked in, preventing change from the front panel. For production and ATE applications, optional GP-IB and RS-232C interfaces are available. An analog control card (voltage/resistor) is also available.

For more information contact Nilsen Technologies, 150 Oxford Street, Collingwood 3066.

Aluminium electros offer hi-rel, stability

BC Components, Europe's largest supplier of passive components, has introduced a new series of miniaturised, low impedance aluminium electrolytic capacitors with excellent filtering/smoothing performance and high pulse current capability. The 150 RMI Series has been designed as the optimum component of its class for SMPS and DC/DC converter applications, featuring a reduced case size compared to the existing 046 RSL and 135 RLI Series, and highly effective filtering, buffering and smoothing characteristics.



Low equivalent series resistance (ESR) at switching frequencies is crucial to the correct operation of switchmode power supplies used for various forms of electronic equipment. Traditional devices with higher ESR can allow switching frequency noise to escape and find its way into signal processing or control circuitry.

A long life of 9 - 23 years at 60°C or 4000 - 10,000 hours at 105°C (dependent on case size) and high ripple current capability, are claimed to make the 150 RMI Series components ideal for demanding applications. The high ripple current capability also allows further cost savings and miniaturisation possibilities by enabling the use of fewer or smaller capacitors in a wide variety of designs.

Uses include power supplies for public switching systems and industrial equipment requiring a high degree of reliability, and advanced injection control systems, fan control and HID headlamp supplies used in the automotive industry. The BC Components production centre for 150 RMI Series is certified in accordance with ISO9001, ISO14001, QS9000 and VDA6.1.

For more information contact **Margot.Memerda@comp.philips.com.** →

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Australia's major test and measurement rental company, Tech-Rentals, now has available for rental or purchase the Redlake MotionScope 250 or 1000 High Speed Video Imaging Systems.

These high speed (up to 250 frames/sec for Model 250; up to 1000f/s for the Model 1000) instruments are claimed as ideally suited to production environments, permitting troubleshooting in high speed packaging lines, conveyor systems, rotating machinery, and rapid vehicle movement analysis, as well as physiological studies, etc.

The frame storage (2048 full frames), video monitor, and control keypad are built into a single, compact unit. The display of pre-trigger information allows the capture of data for intermittent fault analysis.

For more information, contact Tech-Rentals, 12 Maroondah Highway, Ringwood 3134.

World's first 0402 wirewound chip inductors

Coilcraft has claimed a world first with its new 0402CS Series of wirewound chip inductors. The parts measure just 1.19 x 0.64 x 0.61mm, and have an encapsulated top to provide a smooth surface for reliable pick and place handling. Twenty-one part numbers cover the inductance range from 1nH to 40nH, with available tolerances of +/-5% or 10%.

The performance of the inductors is claimed to significantly surpass that of non-wirewound alternatives. For example a 2.2nH Coilcraft part has a Q factor of 100 at 1.8GHz, while a Q of 43 is the highest figure claimed by competitors at the same frequency. Because of their low resistance, Coilcraft chips can handle 200 - 300% more current than non-wirewound 0402 inductors.

Designers are encouraged to take advantage of Coilcraft's liberal free sample policy by calling distributor Tri Components. Designer's Kit C128 is also available, containing all 21 values.

To help engineers incorporate the parts into their designs, Coilcraft also publishes PSPICE models and S-parameters which characterise performance at frequencies up to 6GHz. These files are available on the web at **www.coilcraft.com** or on CD.

For more information contact Tri Components, Unit 1, 32 Miles Street, Mulgrave 3170; phone (03) 9560 2112.

New handheld DMMs

Yokogawa has released three new compact hand-held autoranging digital multimeters with functions for most front-line or bench testing jobs. Called the 732 series, the low cost units feature a very large 4300-count liquid crystal display and ease of use — all measurement functions are selected by a single rotary switch, while other functions are accessed through soft key pushbuttons.

With a basic DC accuracy of 0.3% or 0.5% depending on model, the units, which come with a three-year warranty, offer AC and DC voltage and current measurement, resistance, continuity, diode testing and, on the model 732 03, capacitance measurement. Currents up to 20A can be measured with safety as the units incorporate fused current ranges. Additional functions include automatic hold, manual range selection, over-range alarm and auto power off.

All models conform to EN61010-1 (Cat II 600V and Cat III 300V) safety standard and meet EMC standards EN55011 and EN50082. They are supplied with safety test leads, batteries and spare fuses. Optionally available is a hard carrying case or rubber holster.

For more information contact Yokogawa Australia on (02) 9805 0699 or email to **measurement@yokogawa.com.au**. ❖

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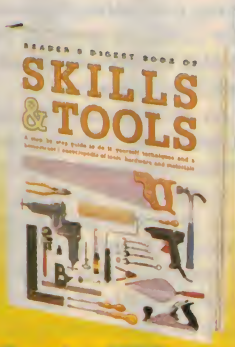

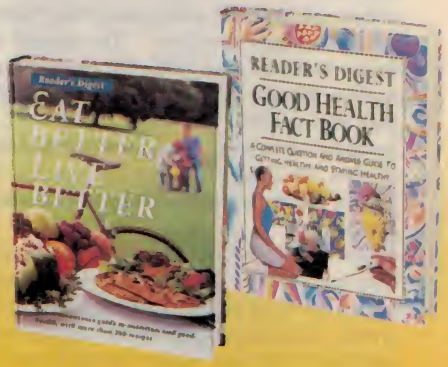

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New Books

Audio basics

BACK-TO-BASICS AUDIO, by Julian Nathan. Published by Butterworth-Heinemann (Newnes imprint), 1998. Soft covers, 234 x 153mm, 344 pages. ISBN 0-7506-9967-1. RRP $80.00.

A practical and very accessible handbook on basic audio theory and practice, written not only for technicians but also for sales people and amateur enthusiasts who 'want to go into things seriously'. The author has many years of experience in the audio and motion picture industry, both in Australia and also in PNG and Hong Kong, and has installed and operated a number of recording studios. He explains in his introduction that 'this is the book I wanted when I first started in audio'.

He starts off with basic electrical principles and measurements, progresses to cover basic theory of things like amplifiers, sound waves and decibels, networks and speakers, and then leads the reader through practical matters such as acoustics, power supplies, mixers, control systems and system planning. There's even sections on soldering techniques, reading schematics and how to install audio cabling. Near the end there's a chapter on the practicalities of home theatre sound, explaining the purpose of a subwoofer and so on.

It's all written and presented in a friendly way, with a bare minimum of maths and a lot of good down-to-earth practical advice. My impression is that it would be an excellent introduction to basic audio theory and practice, for anyone wanting to get into this area.

The review copy came from Butterworth-Heinemann Australia, PO Box 146, Port Melbourne 3207. (J.R.)

Inside micros

INTRODUCTION TO MICROPROCESSORS, by John Crisp. Published by Butterworth Heinemann, 1998. Soft cover, 156 x 234mm, 222 pages. ISBN 0-7506-3787-0. RRP $49.95.

As the title says, this book gives an introduction and overview of microprocessors and related technology. It assumes the reader knows very little about the topic, so quite a lot of space is given over to the basics — binary numbers, the hexadecimal numbering system, conversion between these systems and so on. Binary maths operations are also explained, along with BCD (binary coded decimal) and excess-127 notation. A beginner might find this all a bit overwhelming, and perhaps unnecessary, but it really is essential knowledge if you are programming in assembly or machine language.

Digital gates and the like are covered in several chapters, including the basic gates (AND, OR etc), shift registers and other common digital elements. Memory devices are also described, with brief coverage of most commonly used types, such as the DRAM, EPROM and the EEPROM. The concept of the memory map is also introduced. Interfacing to a microprocessor with devices like the UART is given in the last chapter, which also includes the concepts of serial and parallel data transfer.

Discussion on microprocessors starts at the seventh chapter with a description of a typical microprocessor-based system. The Z80 is given a chapter of its own, on the basis that it's a 'typical 8-bit microprocessor'. Other 8-bit micros such as the 6502 are given a brief mention. Two chapters are devoted to a short coverage of assembly language and high level programming, but don't expect to be a programmer after reading this book. It's introductory only, although it gives an excellent overview of the popular programming languages.

The remainder of the book is about today's microprocessors, such as the Pentium, the Alpha 21164 and the MPC601 (PowerPC). Again these devices are covered briefly, but you'll get a good idea of current developments in the field.

The writing style is friendly, even lighthearted, with the occasional cartoon thrown in to illustrate a point. The review copy came from Butterworth Heinemann, PO Box 146, Port Melbourne 3207. (P.P.)

Vintage collecting

ELECTRONIC CLASSICS: Collecting, Restoration and Repair, by Andrew Emmerson. Published by Butterworth-Heinemann (Newnes imprint), 1996. Soft covers, 233 x 157mm, 413 pages. ISBN 0-7506-3788-9. RRP $65.00.

Collecting old electronic gear of one kind or another can be a very satisfying hobby, and of course isn't restricted to just vintage *radio* receivers and transmitters — even though that's perhaps the best known area, with quite a few clubs and societies and many well-known reference books.

The author of this book takes a broader approach, suggesting that you might well want to select other types of equipment for collecting and restoration/repair: old TV sets or cameras, valve hifi amplifiers, whatever 'turns you on'. In fact he provides a general introduction and guide to just about every aspect of collecting and refurbishing old equipment: tracking it down, acquiring it economically, obtaining parts for restoration, testing and repairing it, where to find information resources (including web sites) and so on.

Although it seems to be written mainly from a UK perspective, as reflected by most of the product information and contact names/addresses, the author does strive to make it as valuable as possible for the reader anywhere in the world. The text is written in a very friendly and accessible style, and although there really aren't many illustrations (unlike many existing 'Vintage Radio' books, which are almost coffee-table picture books), conversely there's a huge amount of 'nitty gritty' information of a practical and technical nature.

On the whole my impression is that it would make an excellent reference for anyone interested in or involved in 'vintage electronics' — both newcomers and those with a few years under their belt.

The review copy came from Butterworth-Heinemann Australia, of PO Box 146, Port Melbourne 3207. (J.R.) ❖

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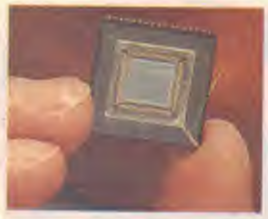

Silicon Valley Newsletter

AOL invests US$1.5B in Hughes Electronics

IN A DEFENSIVE move, America Online is investing US$1.5 billion in DirecTV owner Hughes Electronics, the General Motors subsidiary that owns the DirectTV and DirectPC satellite-based broadcast network. Hughes said it has also signed a deal with Intel, for microprocessors to power a new line of satellite TV set-top boxes.

The deal with Hughes will enable AOL to offer high-speed Internet access across the entire United States, even in the most remote rural areas that are unlikely to see cable TV wiring for another generation, if ever.

AOL's CEO Steve Case said the new partnership would allow AOL to offer high-speed Internet access to households in rural areas, representing about 30% of all American households. "What this alliance does is give us a national footprint for high-speed Internet access. Even if we had deals with all of the cable providers and telephone companies — and we don't — we would not have this national reach", he said.

As many as five million AOL subscribers could be satellite customers by 2003.

Hughes Electronics CEO Mike Smith said his company will offer a so-called 'AOL-Plus' high-speed service that will be offered as part of Hughes' DirecPC service, which currently counts 100,000 customers.

In the Intel deal, Hughes said the chipmaker will supply Hughes with microprocessors to power Hughes' satellite receiver TV set top boxes. The satellite receiver, sold in the American market, will show AOL TV, America Online's new Internet-television service, and the more than 200 TV channels from Hughes's DirectTV, the largest US satellite-TV broadcaster.

Intel moving to 12" wafer production

INTEL, WHICH initially stayed away from the move to 12" (300mm) wafer production, now plans to start high volume manufacturing on 12" fab lines in 2002. The chip giant has insisted in recent years that producing advanced processors on 8" wafers would remain more economical, due to the huge expense of building new 12" facilities and the unproven nature of 12" production technologies and equipment. However it now plans to spend US$1.2 billion building its first 12" lines at facilities in Oregon.

"Larger wafers give the industry the opportunity to improve productivity, allowing Intel to bring ever-more-powerful semiconductor chips at lower costs to consumers around the world", said Michael Splinter, head of Intel's technology and manufacturing group.

The pizza-size 12" wafers allow chipmakers to increase the number of chips per wafer by a factor of 2.4. Despite the higher cost of the wafers and the equipment to make chips, 12" wafers are expected to reduce overall production cost by 30%.

Now that Intel has committed to the next generation of wafers, analysts believe others will likely follow suit quickly.

TSMC to control Acer's IC operations

THE FOUR-YEAR chip market slump and Asia's economic malaise has forced another major consolidation in the semiconductor industry. After Korea's Hyundai and LG Semicon agreed to merge their chip operations, Taiwan Semiconductor Manufacturing (TSMC) and Acer Computer have also announced a new chip operations alliance.

Under the terms of the deal, TSMC will buy a 30% stake (worth US$175 million) in Acer Semiconductor and will manage Acer's chip operations. In return, TSMC will gain access to Acer's production facilities. The latter aspect of the deal represents a major coup for TSMC, whose contract chip production lines are running at full capacity and adding new fab lines is a slow and expensive proposition.

Acer Semiconductor was a DRAM chips-orientated Texas Instruments joint venture called TI-Acer. Acer bought out TI's stake in 1998. Now the unit will be known as TSMC-Acer Semiconductor.

Analysts said the deal will help Acer's management focus on computers and other more lucrative businesses. The problems in the DRAM market have caused huge problems for Acer's overall operations. By using

Chicago firm Microtune, which claims to have produced the world's first analog/digital TV tuner-receiver on a chip, has now announced both PAL and NTSC/PAL versions in addition to the original NTSC version. The new chips are high performance, dual conversion tuners that support international standards, and are capable of supporting the 'next generation' of converged consumer electronics: DTVs, cable modems, cable set-top boxes, PC/TVs and IP telephony systems. (Business Wire)

some of Acer's advanced DRAM lines for its own production of more profitable ICs, both Acer and TSMC stand to benefit financially.

New film to shrink, speed up chips...

WHEN CHIPS RUN cooler, or circuits are made smaller, chips operate faster. A combination of *both* increases significantly the speed of microprocessors and other ICs. A new insulator film developed by equipment maker Novellus is expected to accomplish both, in chips with copper-based interconnects. The firm says that its engineers have developed a new so-called 'low-k' film, with a 'k' (dielectric) factor of 2.4, 10-20% lower than a competing film offered by Applied Materials.

The lower the k factor, the better a film isolates the current flowing though an embedded interconnect wire. The factor determines how closely chipmakers can place electrical circuits next to each other, without causing the current in one circuit to affect current in an adjacent circuit or melt the chip.

Combined with new copper-based interconnect technology, the new Novellus insulator will allow chipmakers to achieve a significant performance improvement without having to redesign their chips. Making the chips smaller will also let them produce more chips per wafer and thus improve productivity and profitability.

"You need the benefits of both copper and low-k to keep up with the demands of microprocessor speed and to lower power consumption", said Wilbert van den Hoek, Novellus VP in charge of insulation films.

Harris gives up on chip business

HARRIS SEMICONDUCTOR, a small but long-time US chipmaker and founding member of the SEMATECH chip research consortium, has thrown in the towel. The company said its parent firm, Harris Corporation, has agreed to sell the semiconductor business to the Sterling Holding Company for US$700 million.

Harris said it is repositioning itself to focus on communications equipment for voice, data and video, and will use the proceeds of the sale to reduce debt and for other general corporate purposes. The Harris chip operation did US$530 million worth of business in the past 12 months. The group employs some 6200 people.

Sterling belongs to Citicorp Venture. Sterling said it will let Harris Semiconductor function as an independent company. Analysts said a public stock offering is likely in the next two years. The agreement does not include Harris' suppression business or photomask operations, which will be sold separately. Harris will hold on to about 10% of the semiconductor business, but will no longer be involved in its operations.

Allen, MCI invest US$600M in wireless web access

DRIVE AROUND Silicon Valley and several other American cities, and you'll notice small radio receiver/transmitter devices atop streetlight and other utility poles — most spaced about a kilometre apart. They belong to Metricom, and provide PC users with the so-called 'Ricochet' wireless access to the Internet on their laptop and other mobile computer devices.

Now Microsoft co-founder Paul Allen and MCI WorldCom have announced they will each invest US$300 million for an 87% stake in Metricom. As part of the deal, MCI signed a five-year, non-exclusive wholesale agreement with Metricom valued at $350 million, to offer the Ricochet service to MCI customers. Metricom also agreed to use MCI's high-speed data and Internet network and support operations.

The Ricochet service operates at an equivalent modem speed of 28kb/s.

Iomega enters CD-RW market

IOMEGA, THE SURVIVING maker of high-capacity removable PC data storage devices and media, announced it is entering the recordable compact disk market with a new line of ZipCDs. The optical recording devices store graphic images, audio and other information that can be played back on recordable compact discs.

Iomega also said it has shipped its 25 millionth Zip drive, the popular high-capacity data storage system that can store roughly 100MB of data. However sales of Zip drives have suffered this year because of falling prices and rivalry from new technologies. Earlier this year, competitor Syquest closed its doors in Fremont, Silicon Valley. Iomega announced in June that it is laying off 10% of its 4800 workers.

US to investigate NEC infringement claim

The US International Trade Commission has launched an investigation to determine whether Japan's NEC is infringing on DRAM memory chip patents held by Ramtron International. The probe comes at the request of Enhanced Memory Systems, a subsidiary of Ramtron, a small Colorado chipmaker (originally from Australia).

In April EMS filed a complaint with ITC alleging that NEC is selling chips that infringe on Ramtron's technology for improving DRAM processing speed. "The ITC has analyzed the claims that we've made and feel that it's serious enough to investigate further", said EMS spokesman David Bondurant.

NEC maintains the technology in question does not represent an infringement on the Ramtron patents. ❖

Music industry loses 'Rio' MP3 player appeal

IN A MAJOR DEFEAT for the music recording industry, the 'Rio' music recording and playback device from Diamond Multimedia of San Jose was set free by the 9th US Circuit Court of Appeals in San Francisco. The court ruled that the handheld device, which can download MP3-based music files from the Internet and play them, does not violate a federal music piracy law.

The unanimous 3-0 decision by the Court means that Diamond Multimedia is free to market the device. The Rio retails for around US$120 in the United States. It hooks up to a computer and allows users to transfer MP3-type compressed music files of near CD-quality music to the device.

The music industry sued Diamond Multimedia in an effort to keep the Rio off the market. It argued that the Rio was designed specifically for the illegal pirating of copyrighted music, and could cost artists and publishers billions of dollars in royalties.

Last fall, US District Judge Audrey Collins of Los Angeles denied the industry's request for an injunction that would have kept the Rio out of retail stores. The industry appealed, but in its ruling the Appeals Court not only upheld Collins, but also found that the Rio was not covered by the anti-piracy law invoked by the Recording Industry Association of America (RIAA).

RIAA spokeswoman Alexandra Walsh said that while her group is disappointed to have lost the case, she conceded that the industry is now developing its own Rio-type playback device. "Fortunately, the shared interest in this marketplace has overtaken the lawsuit."

Platt to stay on as HP Chairman

HEWLETT-PACKARD CEO and chairman Lewis Platt appears to have changed his retirement plans. Instead of withdrawing from HP completely, as he has previously said, Platt has now announced he intends to stay on as chairman until he and the rest of the board are confident that a new chief executive is ready to assume the position of chairman as well.

Analysts said the change of heart probably means that while the company has finalized its list of candidates to take over at the helm, none of them may be strong enough to be put into the role of both CEO and chairman right away.

COMPUTER NEWS & New Products

High performance USB colour scanners

Canon's new CanoScan FB320U and FB620U scanners offer fast and convenient USB compatibility. Both feature the 'plug and play' convenience and speed of Universal Serial Bus (USB) connection, an integrated scanning button plus Canon's innovative LED InDirect Exposure (LIDE) and Contact Image Sensor (CIS) technologies, to deliver brilliant imaging with no distortion.

Compatible with Windows 98, the FB320U and FB620U build on the success of the award winning CanoScan FB range and maintain Canon's trademark slimline compact size. The top-face is only slightly larger than a sheet of A4-sized paper, with a height of only 60mm. Additional benefits include convenient 'push-button' operation of faxing, email and copying, via Canon's Toolbox software, and low power consumption for added value.

The CanoScan FB320U provides a true optical resolution of 300 x 300dpi, while the FB620U offers a true optical resolution of 600 x 600dpi. Both scanners have selectable resolutions up to 1200 and 2400dpi respectively, and also feature 12-bit input to recognise billions of different colours — resulting in more faithful and detailed scans for the home or office user.

Along with Canon's Toolbox software the scanners come with Adobe PhotoDeluxe for easy to use 'guide based' image editing, OmniPage LE OCR software for converting scanned text pages into useable wordprocessor data, and ScanGear — a TWAIN driver allowing PC users to modify image elements prior to the final scan.

The CanoScan FB320U and 620U are available for $299 and $399 RRP respectively, from Canon dealers and many retail stores. For more information contact Canon Australia's Customer Care Support on (02) 9805 2000.

VXI card generates waveforms at 2GS/s

Analogic Corporation's new DBS 2050 is a 2.0GS/s, two-slot, C sized VXI Arbitrary Waveform Generator that can be configured easily to address many applications through its accompanying Plug and Play drivers. Its remarkable speed makes it ideal for disk drive/mass storage, 100BaseT and avionics testing, as well as for network analysis and telecommunications simulations.

Using one channel, the DBS 2050 has a maximum sample rate of 2.0GS/s with an analog bandwidth of over 850MHz (at 0.5Vp-p) and 8-bit vertical resolution. Two channels produce a maximum sample rate of 1.0GS/s, 8-bit vertical resolution. Consistent, accurate waveforms are achieved through test and calibration capabilities resident on the DBS 2050.

The generator houses a high precision clock synthesizer that can be phase-locked to an internal low jitter, low drift reference clock or to an external signal and programmed over a range of 1kS/s to 2.0GS/s. A segmentable 8M word memory that incorporates branching, looping and sequencing is also featured. Each output waveform segment's gain and offset can be changed dynamically.

The DBS 2050 has three program-selectable, low-pass Bessel output filters with cut-off frequencies of 2MHz, 20MHz and 200MHz. Analog signal outputs are differential for one channel operation and single-ended in the two channel mode. Output amplitude can be either 1Vp-p maximum with a bandwidth of over 700MHz, or 4Vp-p maximum with an analog bandwidth of over 165MHz. The DC offset can be programmed to +/-3.5V with a 2mV resolution.

For more information contact Kenelec Scientific, 23 Redland Drive, Mitcham 3132.

Ultra fast SCSI cards for RAID

Adaptec has announced the release of a new family of Ultra2 SCSI RAID (redundant-array independent drive) cards. The AAA-131U2, AAA-133U2, and ARO-1130U2 RAID cards offer twice the performance of Ultra SCSI solutions with no increase in price.

Providing features such as 80MB/sec of Ultra2 SCSI throughout per channel, variable cache memory, and multiple operating system support, the new family meets the needs of the rapidly growing entry-level server and workstation markets.

The cards are priced between $412 and $1665 (including tax) and are available through Adaptec's distribution channel and online store at **www.adaptecstore.com**.

The $920 (including tax) single-channel AAA-131U2 can connect up to 15 Ultra LVD disk drives to deliver any combination of striping performance and redundancy. The $1665 (including tax) three-channel AAA-133U2 delivers all the benefits of the AAA-131U2, but can run up to 45 disk drives across all three of its channels — providing the scalability that workgroup and departmental servers require. Total bandwidth of the AAA-133U2 is also tripled to 240MB/sec.

The ARO-1130U2 is one of the most affordable RAID cards available on the market today and is initially available to OEMs. At $412, the ARO-1130U2 makes the upgrade from SCSI to Ultra2 RAID easy and affordable because it uses the RAIDport III connector and Adaptec SCSI channel already embedded on many motherboards, such as Intel's L440GX+.

The cards support all major RAID levels including 0, 1, 0/1, and 5, and work with NT 4.0, NetWare 4.11/5.0 and UnixWare 7.0 operating systems.

Adaptec's products are distributed by Agate Technology, (02) 9878 4688; Tech Pacific, (02) 9381 6000; and Anabelle Bits, (02) 9384 8000.

Software manages IR connectivity

A new software utility that allows computer users to quickly and easily configure and manage infrared cordless data connections, IrDirector is the first member of the Director family of products from Calibre Inc. It's claimed to be the first software product of its kind to provide a complete solution, automatically setting up connections for cordless connectivity — such as between an IR-enabled notebook computer and an IR-enabled electronic organizer — and also provides users with a display showing connection status.

IrDirector will be offered by Calibre as both an end user product for certain families (such as Palm users) and as an OEM product to manufacturers of IR-enabled notebooks and desktop computers, PDAs, digital cameras, cellphones, scanners, and other electronic systems. When supplied as part of the set-up software for handheld appliances, such as digital cameras, IrDirector also ensures that the majority of IR-enabled host PCs used with the handheld device will be properly configured for infrared communication.

IrDirector initally configures the user's PC to ensure that it is properly set up for infrared connectivity and to address port conflicts problems. Supplying the Calibre IrDA protocol stack and applications, it loads drivers for newly 'discovered' IR-enabled appliances. IrDirector further simplifies infrared connectivity by displaying which applications are associated with each IR-enabled device and automatically launches it upon connection. The various components of IrDirector can be updated via the internet at the click of the mouse, ensuring that the end user always has the latest features and most current Calibre tested and certified device phone book. An icon in the Windows 'tray' displays status information, alerting users to the status of the IR communications subsystem.

For more information visit the Calibre web site at **www.calibre-inc.com**.

'Next generation' network printers

Canon Australia has launched a 'next generation' range of high speed, super resolution digital printer/copiers, backed by a new range of consulting and integration services designed for major enterprise and SME network applications. Responding to rapidly increasing demand for high quality, high speed black and white printing in enterprise environments, the Canon GP range also focusses sharply on the cost and infrastructure management demands confronting IT managers. Canon claims that the package will, for the first time, enable administrators to precisely budget and manage network-wide printing costs.

Developing the technology lead achieved by the award winning Canon GP 215 network printer/fax/copier, which operates at 21 pages per minute, the extended Canon black and white printer/copier range now includes the GP 160 at 16ppm, GP 210 at 21ppm, GP 335 at 33ppm,

GP 405 at 40ppm and GP 605 at 60ppm.

For the new Canon GP printers, print output resolution is an impressive 2400 (equivalent) by 600dpi. Halftone scanning at 600 x 600dpi ensures clean reproduction of photos and illustrations.

Standard full-speed stackless, automatic duplexing is an advanced technology feature of the range. All printers are PostScript (Level 3) and PCL-5e capable. Supported network environments include UNIX, Netware, Windows 95/98 SMB Printing, Windows NT and Apple Talk.

Prices for the Canon GP range start at about $5000 rising to over $40,000 for highly configured, high volume units. Availability for most models is immediate. For more information call Canon Australia on (02) 9805 2000.

Variable-resolution digitising at 100MS/s

National Instruments has unveiled what it claims is a revolutionary advancement in computer-based measurement and automation technologies, with the announcement of a flexible resolution, 100 MS/s digitiser. The new NI 5911 plug-in digitiser incorporates a National Instruments breakthrough Flex ADC technology to realize the lowest noise and highest dynamic range (-160dBfs) of any computer-based digitiser available today.

With this new flexible resolution technology, engineers and scientists are no longer →

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locked into the functionality of a single instrument or hardware product. They can use National Instruments LabVIEW or LabWindows/CVI and the NI 5911 to build numerous computer-based instruments that perform as well as, if not better than, many high-end, stand-alone instruments with similar functionality — at just a fraction of the cost.

Some of the instrument possibilities of the NI 5911 include a 100MHz, 8-bit oscilloscope; a deep memory digitiser; a 50MHz spectrum analyser; a frequency counter or an AC/DC voltmeter.

The NI 5911 variable resolution digitiser delivers unprecedented performance in computer-based measurement applications. It comes with ready-to-run oscilloscope software and an IVI-compliant instrument driver. Other features include 100MS/s real-time sampling; 100MHz input bandwidth; 1GS/s random interleaved sampling; 8 to 21-bit variable resolution based on signal frequency and sample rate; up to -60dBfs spurious free dynamic range; alias protection; 100mV to 10V input range; 4 or 16MB memory depth; flexible analog and digital triggers; software-selectable AC/DC coupling; PCI bus data transfer at up to 132MB/s; and asynchronous pulse train generation.

For more information contact National Instruments Australia, PO Box 466, Ringwood 3134 or visit the company's Web site at **www.natinst.com**.

Cool Edit Pro software upgraded

Syntrillium Software has announced the latest upgrade to its Cool Edit Pro digital audio editing package, version 1.2. Major features of the new release include new Full Reverb, Hard Limiter and Pitch Bender effects; RealMedia G2 support; real-time preview and enhanced quality for almost all effects; and automatic silence detection and deletion.

Version 1.2 also includes a set of video tutorials that demonstrate how to navigate in Cool Edit Pro and use its main features. As with the Version 1.1 release, Version 1.2 upgrades are available free of charge to licensed users of Versions 1.0 and 1.1. Users can download a fully functional demonstration version from Syntrillium's web set at **www.syntrillium.com**.

Cool Edit Pro (US$399) is a digital audio editor, recorder, and mixer application for Windows 95/98 and Windows NT. Created by David Johnston, Cool Edit Pro 1.2 sports a clean, uncluttered interface that puts all the features and power that users need to take their audio projects from concept to completion into one easy-to-use package. The program offers 64-track mixing capability with Record/Solo/Mute controls, Crossfade, Punch-In, Splice, Loop, Multiple Takes, Amplitude and Pan envelopes, and powerful Zoom and Snapping features.

The package also offers more high-quality DSP effects (30+) than any other wave-editing package, including Reverb, Chorus, Dynamics Processing, Graphic and Parametric EQ, 3D Echo Chamber, Noise Reduction, Click and Pop Eliminator, Pitch Shift, Time Stretch/Compress, and many more. Most of the effects include real-time preview and all of them support 24-bit audio.

Cool Edit Pro also works with a host of other audio tools as part of a complete studio environment. It supports DirectX software plug-ins, so users can access DSP modules from leading manufacturers, such as Waves and QSound, directly from within the program. MIDI/SMPTE synchronization capabilities provides seamless integration with MIDI sequencing, video, and other software applications. The program also supports multiple sound cards and WAV devices — up to 16 I/O channels!

Syntrillium also publishes Cool Edit 96, a shareware (US$50) product that is probably the most widely used audio editor in the world. For more information contact Syntrillium Software Corporation, 6210 E. Thomas Road, Suite 104, Scottsdale AZ 85251 or visit their website.

Fast dye-sublimation colour printer

A new dye sublimation printer from Mitsubishi Electric promises faster processing, larger capacity and reduced costs for medical, industrial and other photo-imaging applications. Employing roll-feed technology, the CP800E can print up to 160 standard prints per roll, with the additional benefits of shortened print processing time and lower operating costs.

A standard print time (117 x 88mm image) of approximately 24 seconds makes the CP800E ideal for time critical operations, such as medical applications. Employing three adjustable Gamma Curve Tables to fine tune colour, it offers both versatility and compatability with a wide range of medical equipment such as ultrasound, endoscope and microscope.

The CP800E has a straight paper path to avoid paper jams and can use standard paper or a laminated paper for longer print life,

making it an excellent storage medium. Other features include high resolution, up to 1216 x 600 pixels (max standard size) for superb print clarity; four different programs held in memory, enabling quick and easy connection to a range of equipment; and multi image printing on a single print — up to four high resolution images.

For more information contact Mitsubishi Electric on (02) 9684 7777.

More versions of PCI frame grabbers

Matrox Imaging has announced CompactPCI and PC/104-Plus versions of its Matrox Meteor-II PCI grabbers, which marry the latest PCI bus video capture technology to rugged and compact form factors. Suitable for use in harsh industrial environments and deeply embedded applications, they provide OEMs and integrators with low-cost image capture hardware that is supported by extensive development software, also available from Matrox Imaging.

Matrox Meteor-II for CompactPCI and PC/104-Plus interface to standard NTSC, PAL, RS-170 and CCIR cameras and devices. They provide real-time colour and monochrome video capture, multiple video inputs, PCI bus mastering capabilities, sustained transfers to system memory at up to 130MB/sec and 4MB on-board memory, as well as trigger input. Expansion includes a hardware module for Motion JPEG compression and decompression.

Software support includes the Matrox Imaging Library (MIL) software development toolkit. MIL offers OEMs and system integrators an extensive set of field-proven, high-level functions for image capture, transfer, processing (point-to-point, statistics, filtering, morphology, geometric transforms, FFT, JPEG Codec, and segmentation), pattern matching, blob analysis, gauging, calibration, bar and matrix code reading, OCR, graphics and display.

For more information contact The Dindima Group on (03) 9873 4455 or visit their website at **www.dindima.com**. ❖

Webwatch

BY GRAHAM CATTLEY

Due to popular request, I've collated a list of all the sites ever covered in Webwatch, and it is available for download from both our web site and our BBS in the Internet files section. You can save the file on your own system, and use it as a handy reference, and download the update every month. And if you know of any sites that you feel deserve a mention in Webwatch, drop me a line at grahamc@hannan.com.au, and I'll be happy to include it in an upcoming column.

I'M TAKING the easy way out this month, by presenting a whole column of sites submitted by readers. The trouble is that first site is so good, I'm not sure if I should pass it on...

'Electronics Links and Resources' is a simple linklist sub-divided into several categories, including circuits, component distributors, component manufacturers, electronic design software, and online electronic resources, to name but a few. There are some great sites listed here, some of which will be familiar to regular readers, but the others could well fill a couple of future Webwatch columns, and I might just save them up to make my life easier...

Oh, all right, you win. Go and have a look at **http://www.bc1.com/users/sgl/html/jo4.htm** — but be sure to keep reading Webwatch, won't you? Many thanks to EA reader Logan Squires for this site.

LEE BRAITHWAITE suggested I look at Alex's Electronic Test Bench. Again, this contains a large link list of electronics related sites, some of which are flagged as being highly recommended or technically superior. There's also a Giant Glossary that is rather good; it is a large list linking to other sites that explain the various technical terms concerned. For example, electric motor terminology is explained by Rockwell Electric — an electric motor and automation company. Try spending an hour or so at **http://www.iserv.net/~alexx/index.htm**, and I think that you'll agree that it is worth adding to your favorites list.

THE EDINBURGH ENGINEERING Virtual Library (or EEVL as they are known) is another of those massive Internet libraries that helps you quickly track down the engineering information you are looking for. You can search engineering websites both globally or only those situated in the UK, as well as linking into a large Internet newsgroup search as well.

In a (rather successful) effort to make this site a little less 'dry', there is a distinct Egyptian theme that runs through the pages — which is good, considering that they could have gone for a Scottish theme instead... Thanks to EA reader George Bangerter for suggesting this site, at **http://www.eevl.ac.uk/**.

HARRY'S HOMEBREW HOMEPAGES is a favorite of reader John Denmark — which isn't surprising, as it is a very informative site. Harry's site at **http://sm0vpo.8m.com** features a number of interesting circuits, along with pages of data and technical information, and it is all presented in a very clear and easy to read fashion. Short articles on reading component values, using an oscilloscope and basic soldering make this a good site to visit if you are a beginner in electronics; while details on 100W RF amplifiers and modifying a teleprinter for use with RTTY will appeal to more advanced experimenters, particularly those with Harry's interest in amateur radio.

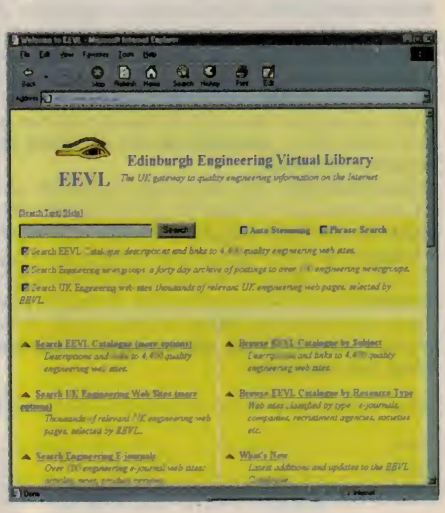
John Denmark also suggests that you look at **http://www.howes-comms.demon.co.uk/Cat-html/Catindex.htm** if you are looking for SSB receiver kits and modules, as they seem to be the only company in the world that offers them, and at reasonable prices too.

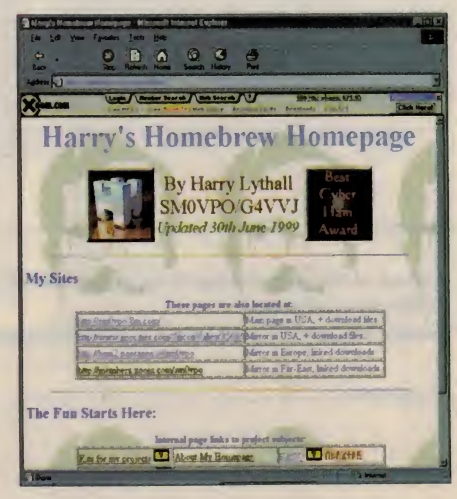
PALMTOP COMPUTING really came of age when the PalmPilot appeared on the scene a couple of years ago — they were really the first *programmable* PDAs available, and the number of applications, games and utilities written for them demonstrates the PalmPilot's power. If you are lucky (or rich) enough to own one, then you'll no doubt be aware of all the PalmPilot software sites around the Web.

What you may *not* be aware of, though, is Gavini Dot Com (**http://www.gavini.com/Public/index.htm**), a site devoted to overclocking your PalmPilot. A lot of the site covers their Afterburner][overclocking utility, but there's stuff here for anyone interested in the less-than-software side of their PalmPilot.

THE AMIGA doesn't get much of a look-in these days, what with the latest Pentium III and AMD K7 CPU stealing the limelight. But if you are a passionate Amiga user (and believe me, Amiga users are very passionate) *and* interested in PIC programming, then mark krawczuk suggests you look at **http://sunsite.doc.ic.ac.uk/~aminet**, where you can download MiniPIC.lha.

This contains schematics and software for programming PICs, and Mark seems to be impressed with it. Of course, if you are an Amiga user and you don't know of the Aminet site, then you are missing out on more software than you could ever use, so check it out. ❖





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KEY TO CODING

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Allthings Sales & Services 53,72/73
Audioworks .....OBC
Campad Electronics 72/73
Colourview Electronics 35
Computronics 72/73
Dick Smith Electronics 44-47
EA subscriptions offer 91
Emona Instruments .....Centre Insert
FPC Marketing 89
Harbuch Electronics 85
Instant PCBs 72/73
Hong Kong Trade Fair 79
Jaycar Electronics 30-33,72/73
JED Microprocessors 29
Kalex 40
ME Technologies 72/73
Microgram Computers 25
Netcraft Australia 85
Oatley Electronics 55,IBC
Obiat 87
Peter C. Lacey Services 85
Pioneer Electronics Aust. .....IFC
Questronix 21,72/73
RCS Radio 72/73
Robot.Oz.com.au 21
Speakerworks 21
Stantron Australia 95
Taig Machinery 72/73
Tri Components 9,43
VAF Research 13

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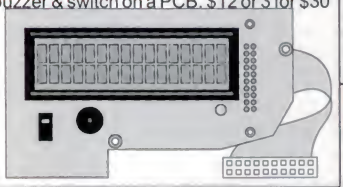

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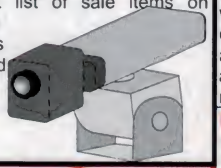

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Kit includes all components needed.....

PCB plus all on-board components, connectors, switch, metal case, telescopic antenna, twin RCA A/V lead, all that is needed to complete the full kit. 12Vdc @10mA operation. Ideal for transmitting audio and video around you home.. Complete Kit for just $25

suitable plugcack $5

$25

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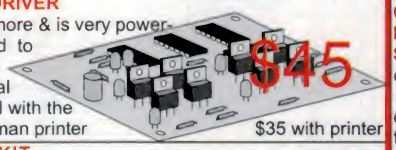

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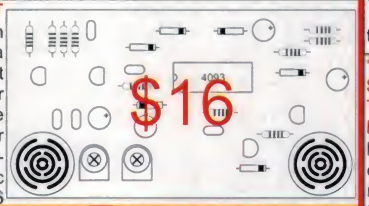

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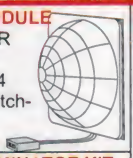

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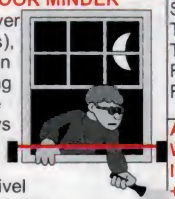

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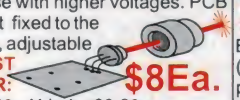

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With strong universal swivel mount & 50X50X50mm housing: 10 LED $10... 30 LED $20...80 LED $36

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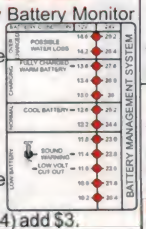
This kit is a sw-mode design & correctly controls temp. of peltiers to 10A (very efficient design) PCB + onboard parts + new surplus case. $15

COMPLETE INTELLIGENT BATTERY / POWER MANAGEMENT SYSTEM

For the home or car New Battery Monitor Kit: 12v / 24v monitor with low voltage cutout, audible alarm before cutout. Designed to use minimal power & 12 led bar-graph indicator. Kit inc PCB, all onboard parts, label, 10A cutout MOSFET + suitable surplus case for $32.... For 50A MOSFET (IRFZ44) add $3.



To complete your solar system we have **12-24V SOLAR REGULATOR KIT:** 15A Kit inc all onboard parts & PCB. $25

4 CHANNEL VIDEO SWITCHER KIT

This kit can switch manually or sequentially up to 4 audio/video sources. Features inc. VCR relay output for STOP / REC, can be switched with PIR or alarm inputs Add a security channel to your TV with a VHF modulator, watch TV & flick channels & see who's at the door can be auto switched using PIR units Kit + PCB + all on-bourd parts $50. Optional VHF modulator / mixer $18

PELTIER EFFECT DEVICES

Make a solid state food cooler / warmer for the car etc. with 2 heatsinks, a fan and one of the following. Could be used for cooling overclocked PC CPUs. All 40 X 40mm.

4A △T 65deg. Qmax 42W $25
6A △T 65deg. Qmax 60W $27.50
8A △T 65deg. Qmax 75W $30

Device comes with instructions to build cooler / heater plus data. Some used surplus heatsinks avail.

NEW**NEW*****NEW*****NEW*** QUALITY AUSTRALIAN MADE FEATURE PACKED MINI ALARM SYSTEM.

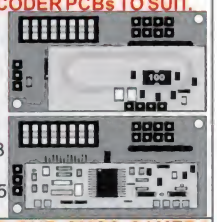
Features inc. boot release, central locking output, imobiliser output, indicator flash relay. Has with 2 key-fob transmitter keys.

Drawn in proportion

NEW***NEW*****NEW*****NEW******NEW*** SAW RESONATOR LOCKED. NO TUNING 433 MHz UHF DATA TX & RX MODULES +ENCODER PCBs TO SUIT.

Many security codes, 4 zones, multi channel. See our WEB SITE for more

TX module $11
TX + encoder $18
RX module $18
RX + encoder $25



AT LAST! A COLOUR CMOS CAMERA WITH GOOD RESOLUTION + BUILT IN AUDIO + FREE PLUG PACK + FREE VHF MODULATOR.

Available with swivel mount or dome mount housing.

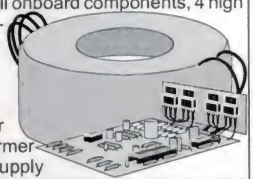
$160

$160

BNC connector (video), DC connector (power), RCA connector (audio). 330000 p i x e l . 3 3 0 T V l i n e r e s . 7-12Vdc 55mA max. INTRO PRICE $160

NEW 12VDC-240VAC/300VAINVERTER

This new design is very efficient, is rated at 300VA constant not peak (when our transformer is used). It has auto switch on and uses High power MOS-FETS that require very minimal heat-sinking. The kit inc. PCBs, all onboard components, 4 high power MOS-FETs and all for $35 To save money you can use your own transformer or we can supply the Kit + a high quality compact toroidal transformer plus wiring kit plus a used large electrolytic capacitor for $89



** CCD CAMERA SPECIAL ** WITH A FREE UHF MODULATOR

The best "value for money" CCD camera on the market! 0.1 lux, High IR response & hi-res. Better than most cheaper models. **32 X 32mm $99...** With 1of these lenses pinhole (60deg.), 92 deg.; 120 deg. or for (150 deg) add $10

KEF Q-Series Home Theatre

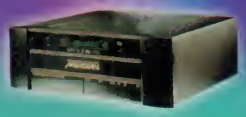
audio works

LUXMAN

KEF

audioquest

CELESTION



MERIDIAN

Celestion C-Series Home Theatre

Audioworks

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